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Part of the FOCUS consultancy group

Energy Efficiency & Renewable Energy Plan

1 Hampshire Street, London NW5 2TE

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About *MES Building Solutions*

***MES Building Solutions* is an established consultancy practice specialising in providing building solutions throughout the UK.**

We offer a full range of services for both residential and commercial buildings from small individual properties through to highly complex mixed use developments.

We are an industry leader in delivering a professional, accredited and certified service to a wide range of clients including architects, developers, builders, housing associations, the public sector and private householders.

Employing highly qualified staff, our team comes from a variety of backgrounds within the construction industry with combined knowledge of building design, engineering, assessment, construction, development, research and surveying.

We are renowned for our creative thinking and provide a high quality, honest and diligent service.

MES Building Solutions maintains its position at the forefront of changes in planning, building regulations and neighbourly matters, as well as technological advances. Our clients, large or small are therefore assured of a cost effective, cohesive and fully integrated professional service.

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Section 1: Introduction

1.1 Executive Summary

MES Building Solutions have been retained to provide an Energy Efficiency and Renewable Energy Plan to demonstrate how the proposed development at 1 Hampshire Street will comply with the requirements of the Section 106 agreement for this development. The purpose of this report is to provide an overview of how the development will comply with the existing Energy & Sustainability Statement, reduce CO_2 emissions by 35% over Part L 2013 and address the requirements as laid out in the Section 106 agreement.

Full details can be found in the main body of the report, but a summary of the main points can be found below;

a) Full design stage SAP and NCM calculations have been undertaken by relevant professionals and these demonstrate that the total CO_2 reduction in emissions over and above the Part L 2013 baseline is 38.31% - see Table 1a below.

Table 1a: Total anticipated reduction in regulated emissions and energy use

		Part L		SAP 10[1]	
		kWh/year	Tonnes CO_2/year	kWh/year	Tonnes CO_2/year
Residential	Baseline	88,324	21.21	88,324	18.71
	Proposed	70,529	13.13	70,529	14.65
Commercial	Baseline	42,408	7.32	42,408	7.32
	Proposed	30,934	4.47	30,934	4.47
Combined	Baseline	130,732	28.53	130,732	26.03
	Proposed	101,463	17.60	101,463	19.12
Reduction over Part L		**22.39%**	**38.31%**	**22.39%**	**26.55%**

b) Section A, above, confirms how the development will achieve a 38% reduction in CO_2 based on the full Design Stage SAP and NCM calculations that have been undertaken by relevant professionals. An additional iteration of these has also been undertaken excluding the proposed low and zero carbon technologies (PV). The baseline of Part L 2013 compliance, these additional 'be lean, be clean' SAPs & NCM calculations and the final full SAP & NCM calculations can then be compared. This demonstrates that the total CO_2 reduction in emissions provided

[1] SAP10 emission factors have been used only on the residential scheme

by the proposed PV low and zero carbon technology is 32.5% - see Table 1b below.

Table 1b: CO_2 reduction from low carbon & renewable technologies.	
Total 'baseline' Part L 2013 compliant CO_2 emissions (Tonnes CO_2 per year)	28.53
Total 'be lean, be clean' Part L 2013 compliant CO_2 emissions (Tonnes CO_2 per year)	26.08
Total 'be lean, be clean, be green' Part L 2013 compliant CO_2 emissions (Tonnes CO_2 per year)	**17.60**
Achieved reduction from renewable or low carbon technologies. (Tonnes CO_2 per year)	**8.48**
Achieved reduction from renewable or low carbon technologies. (% over 'be lean, be clean')	**32.5%**

c) Separate metering of the proposed low and zero carbon technologies (PV) will be provided. The installation will be undertaken in line with MCS standards and following the additional guidance of the Smart Export Guarantee scheme, which requires dedicated generation and export meters. This will enable both the generation of the LZC technology to be monitored, but also how much of this is being used within the development and how much is being exported.

d) As this development is comprised on individual apartments and commercial units with each having its own dedicated heating system there is no centralised control system or plant present. As such a single Building Management System cannot be provided.

e) No measures have been incorporated into the development because the location of the scheme offers no available heat network to be connected to in the near future. In addition, the increasing decarbonisation of the electricity network in the UK means that low carbon heating in the future will be best served by the use of heat pumps rather than district heating systems, particularly for developments of the scale of that proposed.

f) Full Design Stage SAP and NCM calculations have been undertaken and can be found appended to this report.

g) Full As-Built Stage SAP and NCM calculations will be undertaken on completion of the development, as is required by Part L of the Building Regulations. These documents will be made available to Camden Council following their production in line with requirement h, below.

h) It is proposed that the Owner of the development will provide additional information as required to the 'Planning Obligations

Officer' as detailed in the Section 106 agreement under Definition 2.29.

1.2 Section 106 & Planning Policy

A Section 106 agreement is in place for the proposed development at 1 Hampshire Street and this details a number of requirements of an Energy Efficiency and Renewable Energy Plan as part of definition 2.20. This Plan should provide;

a strategy setting out a package of measures to be adopted by the Owner in the management of the Development with a view to reducing the carbon energy emissions through (but not limited to) the following:-

a) *the incorporation of the measures set out in the submission document entitled Energy & Sustainability Statement prepared by Build Energy Limited and dated 18th May 2017 to achieve a 35% reduction in CO2 emissions beyond the Part L 2013 baseline;*
b) *further details (including detailed drawings, any necessary surveys and system specifications) of how the Owner will reduce the developments carbon emissions from renewable energy technologies located on the Property ensuring the Owner will target a reduction of at least 30% in carbon emissions in relation to the Property using a combination of complimentary low and zero carbon technologies;*
c) *separate metering of all low and zero carbon technologies to enable the monitoring of energy and carbon emissions and savings;*
d) *a building management system being an electronic system to monitor the Development's heating and cooling and the hours of plant use;*
e) *measures to enable future connection to a local energy network that has been designed in accordance with the 'CIBSE heat networks; code of practice for the UK' at the boundary of the property*
f) *include a pre-implementation design-stage review by an appropriately qualified and recognised independent professional in respect of the Property including Full Design stage SAP (for the residential uses) and NCM (for the non-residential uses) calculations certifying that the measures incorporated in the Energy Efficiency and Renewable Energy Plan are achievable in the Development and satisfy the aims and objectives of the Council's strategic policies on the reduction of carbon emissions contained within its Development Plan;*
g) *measures to secure a post construction review of the Development by an appropriately qualified and recognised independent professional in respect of the Property (including but not limited to photographs, installation contracts and full*

As-Built SAP and NCM calculations) certifying that the measures incorporated in the Energy Efficiency and Renewable Energy Plan have been achieved in the Development and will be maintainable in the Development's future management and occupation; and

h) *identifying means of ensuring the provision of information to the Council and provision of a mechanism for review and update as required for time to time.*

National Policy

In February 2019, the Government published the National Planning Policy Framework (NPPF) which superseded a number of planning policies including the Planning Policy Statement (PPS) suite.

The NPPF outlines the Government's planning policies for England. It provides a framework within which local people and accountable councils can produce their own distinctive local plan which reflect the needs and priorities of their neighbourhoods and communities. The purpose of the NPPF is to contribute to the achievement of sustainable development.

The NPPF aims to strengthen local decision making as a way to foster the delivery of sustainable developments. However, the NPPF also outlines that sustainable developments require careful attention to viability and costs in plan-making and decision-taking processes. Over everything else, plans should be deliverable. Therefore, the size and scale of development within the plan should not be subjected to large scale obligations and burdens, so that their ability to be developed viably is threatened.

The NPPF guidance promotes planning for climate change. Chapter 14 of the NPPF, Meeting the Challenge of Climate Change, Flooding and Coastal Change (paragraphs 149 to 154) state that:

Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating from rising temperatures. Policies should support appropriate measures to ensure the future resilience of communities and infrastructure to climate change impacts, such as providing space for physical protection measures, or making provision for the possible future relocation of vulnerable development and infrastructure.

- New development should be planned for in ways that:

- Avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure; and
- Can help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards.

- To help increase the use and supply of renewable and low carbon energy and heat, plans should:
  - Provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts);
  - Consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and
  - Identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers.

- Local planning authorities should support community-led initiatives for renewable and low carbon energy, including developments outside areas identified in local plans or other strategic policies that are being taken forward through neighbourhood planning.

- In determining planning applications, local planning authorities should expect new development to:
  - Comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and
  - Take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.

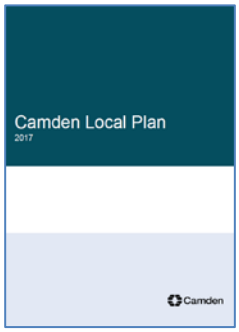
- When determining planning applications for renewable and low carbon development, local planning authorities should:
  - Not require applicants to demonstrate the overall need for renewable or low carbon energy, and recognise that even

small-scale projects provide a valuable contribution to cutting greenhouse gas emissions; and

Approve the application if its impacts are (or can be made) acceptable. Once suitable areas for renewable and low carbon energy have been identified in plans, local planning authorities should expect subsequent applications for commercial scale projects outside these areas to demonstrate that the proposed location meets the criteria used in identifying suitable areas.

Camden Local Plan 2017

Policy CC1 Climate change mitigation



The Council will require all development to minimise the effects of climate change and encourage all developments to meet the highest feasible environmental standards that are financially viable during construction and occupation.

We will:

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

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

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

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

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

f. expect all developments to optimise resource efficiency. For decentralised energy networks, we will promote decentralised energy by:

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

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

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

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

Policy CC2 Adapting to climate change

The Council will require development to be resilient to climate change.

All development should adopt appropriate climate change adaptation measures such as:

a. the protection of existing green spaces and promoting new appropriate green infrastructure;

b. not increasing, and wherever possible reducing, surface water runoff through increasing permeable surfaces and use of Sustainable Drainage Systems;

c. incorporating bio-diverse roofs, combination green and blue roofs and green walls where appropriate; and

d. measures to reduce the impact of urban and dwelling overheating, including application of the cooling hierarchy.

Any development involving 5 or more residential units or 500 sqm or more of any additional floorspace is required to demonstrate the above in a Sustainability Statement.

Sustainable design and construction measures

The Council will promote and measure sustainable design and construction by:

e. ensuring development schemes demonstrate how adaptation measures and sustainable development principles have been incorporated into the design and proposed implementation;

f. encourage new build residential development to use the Home Quality Mark and Passivhaus design standards;

g. encouraging conversions and extensions of 500 sqm of residential floorspace or above or five or more dwellings to achieve "excellent" in BREEAM domestic refurbishment; and

h. expecting non-domestic developments of 500 sqm of floorspace or above to achieve "excellent" in BREEAM assessments and encouraging zero carbon in new development from 2019.

London Plan (2016)

Policy 5.2 Minimising Carbon Dioxide Emissions
Planning decisions

A Development proposals should make the fullest contribution to minimising carbon dioxide emissions in accordance with the following energy hierarchy:

1 Be lean: use less energy
2 Be clean: supply energy efficiently
3 Be green: use renewable energy

B The Mayor will work with boroughs and developers to ensure that major developments meet the following targets for carbon dioxide emissions reduction in buildings. These targets are expressed as minimum improvements over the Target Emission Rate (TER) outlined in the national Building Regulations leading to zero carbon residential buildings from 2016 and zero carbon non-domestic buildings from 2019.

Residential buildings:

Year	Improvement on 2010 Building Regulations
2010 – 2013	25 per cent (Code for Sustainable Homes level 4)
2013 - 2016	40 per cent
2016 - 2031	Zero Carbon

Non-domestic buildings:

Year	Improvement on 2010 Building Regulations
2010 – 2013	25 per cent
2013 - 2016	40 per cent
2016 - 2019	As per building regulations requirements
2019 - 2031	Zero Carbon

C Major development proposals should include a detailed energy assessment to demonstrate how the targets for carbon dioxide emissions reduction outlined above are to be met within the framework of the energy hierarchy.

D As a minimum, energy assessments should include the following details:

a calculation of the energy demand and carbon dioxide emissions covered by Building Regulations and, separately, the energy demand and carbon dioxide emissions from any other part of the development, including plant or equipment, that are not covered by the Building Regulations (see paragraph 5.22) at each stage of the energy hierarchy

b proposals to reduce carbon dioxide emissions through the energy efficient design of the site, buildings and services

c proposals to further reduce carbon dioxide emissions through the use of decentralised energy where feasible, such as district heating and cooling and combined heat and power (CHP)

d proposals to further reduce carbon dioxide emissions through the use of on-site renewable energy technologies.

E The carbon dioxide reduction targets should be met on-site. Where it is clearly demonstrated that the specific targets cannot be fully achieved on-site, any shortfall may be provided off-site or through a cash in lieu contribution to the relevant borough to be ring fenced to secure delivery of carbon dioxide savings elsewhere.

Policy 5.3 Sustainable Design and Construction

Strategic

A The highest standards of sustainable design and construction should be achieved in London to improve the environmental performance of new developments and to adapt to the effects of climate change over their lifetime.

Planning decisions

B Development proposals should demonstrate that sustainable design standards are integral to the proposal, including its construction and operation, and ensure that they are considered at the beginning of the design process.

C Major development proposals should meet the minimum standards outlined in the Mayor's supplementary planning guidance and this should be clearly demonstrated within a design and access statement.

The standards include measures to achieve other policies in this Plan and the following sustainable design principles:

a minimising carbon dioxide emissions across the site, including the building and services (such as heating and cooling systems)
b avoiding internal overheating and contributing to the urban heat island effect
c efficient use of natural resources (including water), including making the most of natural systems both within and around buildings
d minimising pollution (including noise, air and urban runoff)
e minimising the generation of waste and maximising reuse or recycling
f avoiding impacts from natural hazards (including flooding)
g ensuring developments are comfortable and secure for users, including avoiding the creation of adverse local climatic conditions
h securing sustainable procurement of materials, using local supplies where feasible, and
i promoting and protecting biodiversity and green infrastructure.

LDF preparation

D Within LDFs boroughs should consider the need to develop more detailed policies and proposals based on the sustainable design principles outlined above and those which are outlined in the Mayor's supplementary planning guidance that are specific to their local circumstances.

Policy 5.6 Decentralised Energy in Development Proposals

Planning decisions

A Development proposals should evaluate the feasibility of Combined Heat and Power (CHP) systems, and where a new CHP system is appropriate also examine opportunities to extend the system beyond the site boundary to adjacent sites.

B Major development proposals should select energy systems in accordance with the following hierarchy:

1 Connection to existing heating or cooling networks;
2 Site wide CHP network;
3 Communal heating and cooling;

C Potential opportunities to meet the first priority in this hierarchy are outlined in the London Heat Map tool. Where future network opportunities are identified, proposals should be designed to connect to these networks.

Policy 5.7 Renewable Energy

Strategic
A The Mayor seeks to increase the proportion of energy generated from renewable sources, and expects that the projections for installed renewable energy capacity outlined in the Climate Change Mitigation and Energy Strategy and in supplementary planning guidance will be achieved in London.

Planning decisions
B Within the framework of the energy hierarchy (see Policy 5.2), major development proposals should provide a reduction in expected carbon dioxide emissions through the use of on-site renewable energy generation, where feasible.

LDF preparation
C Within LDFs boroughs should, and other agencies may wish to, develop more detailed policies and proposals to support the development of renewable energy in London – in particular, to identify broad areas where specific renewable energy technologies, including large scale systems and the large scale deployment of small scale systems, are appropriate. The identification of areas should be consistent with any guidelines and criteria outlined by the Mayor.

D All renewable energy systems should be located and designed to minimise any potential adverse impacts on biodiversity, the natural environment and historical assets, and to avoid any adverse impacts on air quality.

London Plan (December 2019) - Intend to publish version

A draft new London Plan was published by the Mayor for consultation in December 2017, although the current 2016 Plan is still the adopted Development Plan, the proposed document is given significant weight.

Policy SI 2 Minimising greenhouse gas emissions

A Major development should be net zero-carbon. This means reducing greenhouse gas emissions in operation and minimising both annual and peak energy demand in accordance with the following energy hierarchy:

1) be lean: use less energy and manage demand during operation

2) be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly
3) be green: maximise opportunities for renewable energy by producing, storing and using renewable energy on-site
4) be seen: monitor, verify and report on energy performance.

B Major development proposals should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy.

C A minimum on-site reduction of at least 35 per cent beyond Building Regulations156 is required for major development. Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures. Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, in agreement with the borough, either:

1) through a cash in lieu contribution to the borough's carbon offset fund, or
2) off-site provided that an alternative proposal is identified and delivery is certain.

D Boroughs must establish and administer a carbon offset fund. Offset fund payments must be ring-fenced to implement projects that deliver carbon reductions. The operation of offset funds should be monitored and reported on annually.

E Major development proposals should calculate and minimise carbon emissions from any other part of the development, including plant or equipment that are not covered by Building Regulations, i.e. unregulated emissions.
F Development proposals referable to the Mayor should calculate whole life-cycle carbon emissions through a nationally recognised Whole Life-Cycle Carbon Assessment and demonstrate actions taken to reduce life-cycle carbon emissions.

Policy SI 3 Energy infrastructure

A Boroughs and developers should engage at an early stage with relevant energy companies and bodies to establish the future energy and infrastructure requirements arising from large-scale development proposals such as Opportunity Areas, Town Centres, other growth areas or clusters of significant new development.

B Energy masterplans should be developed for large-scale development locations (such as those outlined in Part A and other opportunities) which establish the most effective energy supply options. Energy masterplans should identify:

1) major heat loads (including anchor heat loads, with particular reference to sites such as universities, hospitals and social housing)
2) heat loads from existing buildings that can be connected to future phases of a heat network
3) major heat supply plant including opportunities to utilise heat from energy from waste plants
4) secondary heat sources, including both environmental and waste heat
5) opportunities for low and ambient temperature heat networks
6) possible land for energy centres and/or energy storage
7) possible heating and cooling network routes
8) opportunities for futureproofing utility infrastructure networks to minimise the impact from road works
9) infrastructure and land requirements for electricity and gas supplies
10) implementation options for delivering feasible projects, considering issues of procurement, funding and risk, and the role of the public sector
11) opportunities to maximise renewable electricity generation and incorporate demand-side response measures.

C Development Plans should:
1) identify the need for, and suitable sites for, any necessary energy infrastructure requirements including energy centres, energy storage and upgrades to existing infrastructure
2) identify existing heating and cooling networks, identify proposed locations for future heating and cooling networks and identify opportunities for expanding and inter-connecting existing networks as well as establishing new networks.
D Major development proposals within Heat Network Priority Areas should have a communal low-temperature heating system:
1) the heat source for the communal heating system should be selected in accordance with the following heating hierarchy:

a) connect to local existing or planned heat networks
b) use zero-emission or local secondary heat sources (in conjunction with heat pump, if required)
c) use low-emission combined heat and power (CHP) (only where there is a case for CHP to enable the delivery of an area-wide heat network, meet the development's electricity demand and provide demand response to the local electricity network)
d) use ultra-low NOx gas boilers

2) CHP and ultra-low NOx gas boiler communal or district heating systems should be designed to ensure that they meet the requirements in Part B of Policy SI 1 Improving air quality 3) where a heat network is planned but not yet in existence the development should be designed to allow for the cost-effective connection at a later date.

E) Heat networks should achieve good practice design and specification standards for primary, secondary and tertiary systems comparable to those set out in the CIBSE/ADE Code of Practice CP1 or equivalent.

Policy SI 4 Managing heat risk

A Development proposals should minimise adverse impacts on the urban heat island through design, layout, orientation, materials and the incorporation of green infrastructure.

B Major development proposals should demonstrate through an energy strategy how they will reduce the potential for internal overheating and reliance on air conditioning systems in accordance with the following cooling hierarchy:

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

Policy SI 12 Flood risk management

A Current and expected flood risk from all sources (as defined in paragraph 9.12.2) across London should be managed in a sustainable and cost-effective way in collaboration with the Environment Agency, the Lead Local Flood Authorities, developers and infrastructure providers.
B Development Plans should use the Mayor's Regional Flood Risk Appraisal and their Strategic Flood Risk Assessment as well as Local Flood Risk Management Strategies, where necessary, to identify areas where particular and cumulative flood risk issues exist and develop actions and policy approaches aimed at reducing these risks. Boroughs should co-operate and jointly address cross-boundary flood risk issues including with authorities outside London.

C Development proposals should ensure that flood risk is minimised and mitigated, and that residual risk is addressed. This should include, where possible, making space for water and aiming for development to be set back from the banks of watercourses.

D Developments Plans and development proposals should contribute to the delivery of the measures set out in Thames Estuary 2100 Plan. The Mayor will work with the Environment Agency and relevant local planning authorities, including authorities outside London, to safeguard an appropriate location for a new Thames Barrier.

E Development proposals for utility services should be designed to remain operational under flood conditions and buildings should be designed for quick recovery following a flood.

F Development proposals adjacent to flood defences will be required to protect the integrity of flood defences and allow access for future maintenance and upgrading. Unless exceptional circumstances are demonstrated for not doing so, development proposals should be set back from flood defences to allow for any foreseeable future maintenance and upgrades in a sustainable and cost-effective way.

G Natural flood management methods should be employed in development proposals due to their multiple benefits including increasing flood storage and creating recreational areas and habitat.

Government's ministerial statement (March 2015)

"The government's policy is that planning permissions should not be granted requiring, or subject to conditions requiring, compliance with any technical housing standards other than for those areas where authorities have existing policies on access, internal space, or water efficiency".

From 1 October 2015: Existing Local Plan, neighbourhood plan, and supplementary planning document policies relating to water efficiency, access and internal space should be interpreted by reference to the nearest equivalent new national technical standard. Decision takers should only require compliance with the new national technical standards where there is a relevant current Local Plan policy.

Where policies relating to technical standards have yet to be revised, local planning authorities are advised to set out clearly how the existing policies will be applied in decision taking in light of this statement.

1.3 SAP 10

The following guidance was issued by the GLA, in October 2018, for all new developments.

'Grid electricity has been significantly decarbonised since the last update of Part L in April 2014 and in July 2018 the Government published updated carbon emission factors (SAP 10) demonstrating this. These new emission factors will however not be incorporated into Part L of the Building Regulations until the Government has consulted on new Building Regulations.

The impact of these new emission factors is significant in that technologies generating on-site electricity (such as gas-engine CHP and solar PV) will not achieve the carbon savings they have to date. It is therefore anticipated that developments will need to utilise alternative or additional technologies to meet the 35 per cent on-site carbon reduction target, including using zero emission or local secondary heat sources.

The GLA has decided that from January 2019 and until central Government updates Part L with the latest carbon emission factors, planning applicants are encouraged to use the SAP 10 emission factors for referable applications when estimating CO_2 emission performance against London Plan policies. This will ensure that the assessment of new developments better reflects the actual carbon emissions associated with their expected operation'.

As a result of the above guidance, MES have based the reduction targets on the current Part L emission factors, as these are the ones that the EPC certificates are currently assessed against, whilst still showing the impact that SAP 10 will have.

	Emissions kg CO_2 per kWh	
	SAP 2012	**SAP 10**
Mains Gas	0.216	0.210
Electricity	0.519	0.233

1c: SAP 2012 and SAP 10 emission factors

Section 2: Description of development

2.1 Location

The application site is that of two existing two storey buildings located at 1 Hampshire Street, NW5 2TE.

The site is to the east of Torriano Avenue and approximately 3miles to the North of the city of London.

There are excellent transport links close to the development site with a PTAL rating of 5 being achieved. Caledonian Road underground station to the east and Kentish Town railway station to the west are both within walking distance. Regular bus routes are also available on York Way and Camden Road.

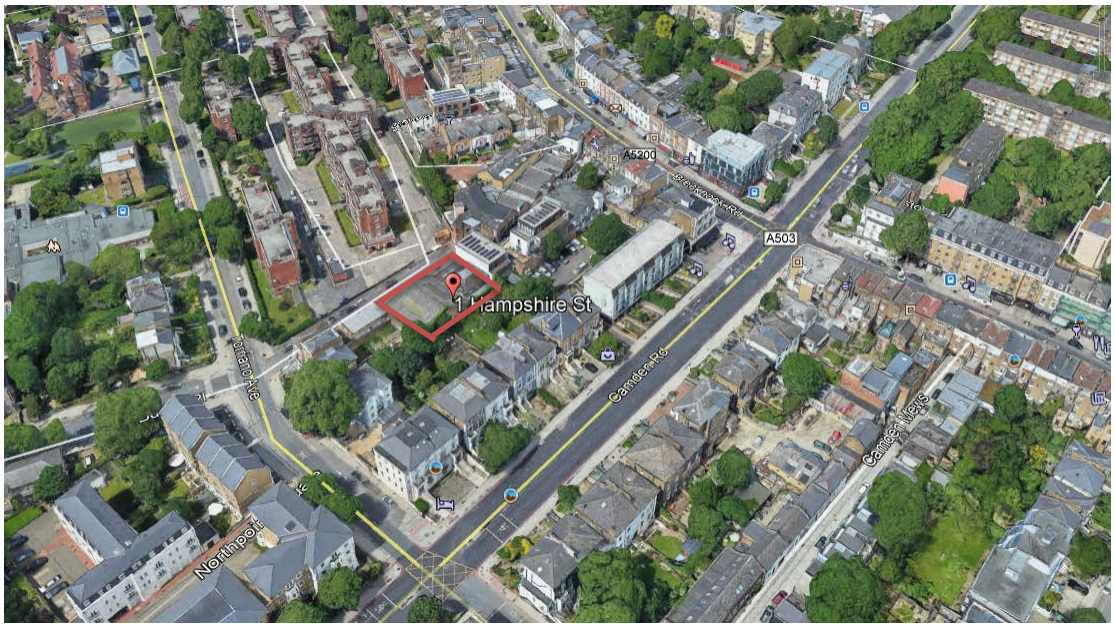


Figure 2.1: Site location. (Google Maps)

2.2 Details of development

The proposed mixed-use redevelopment will consist of three new commercial units at ground floor and 16 residential flats with landscaping, cycle and waste storage will also be incorporated.

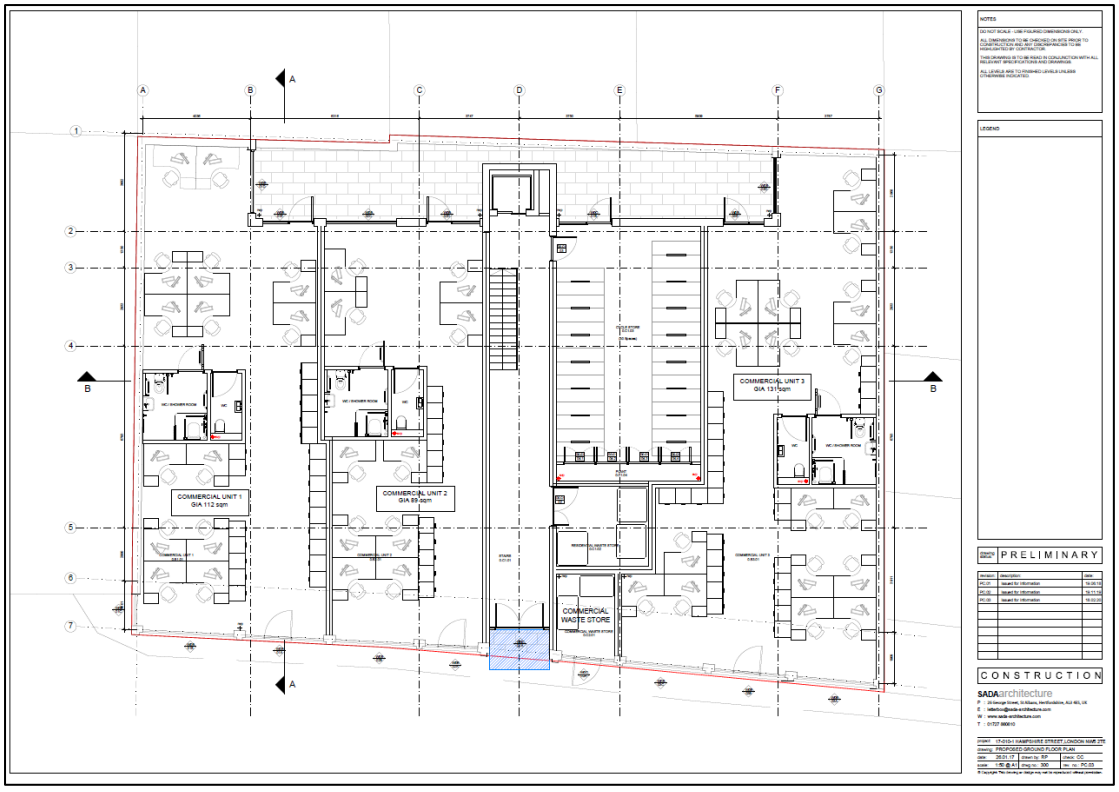
The proposed commercial units at ground floor level fronting Hampshire Road are each with an area of 89-131sqm (332sqm total). The development is designed in a way to ensure flexibility within this floor space, allowing units to be used by a range of potential occupiers to meet the operational requirements of their business

There will be no off-street car parking as the development proposes a car-free approach.

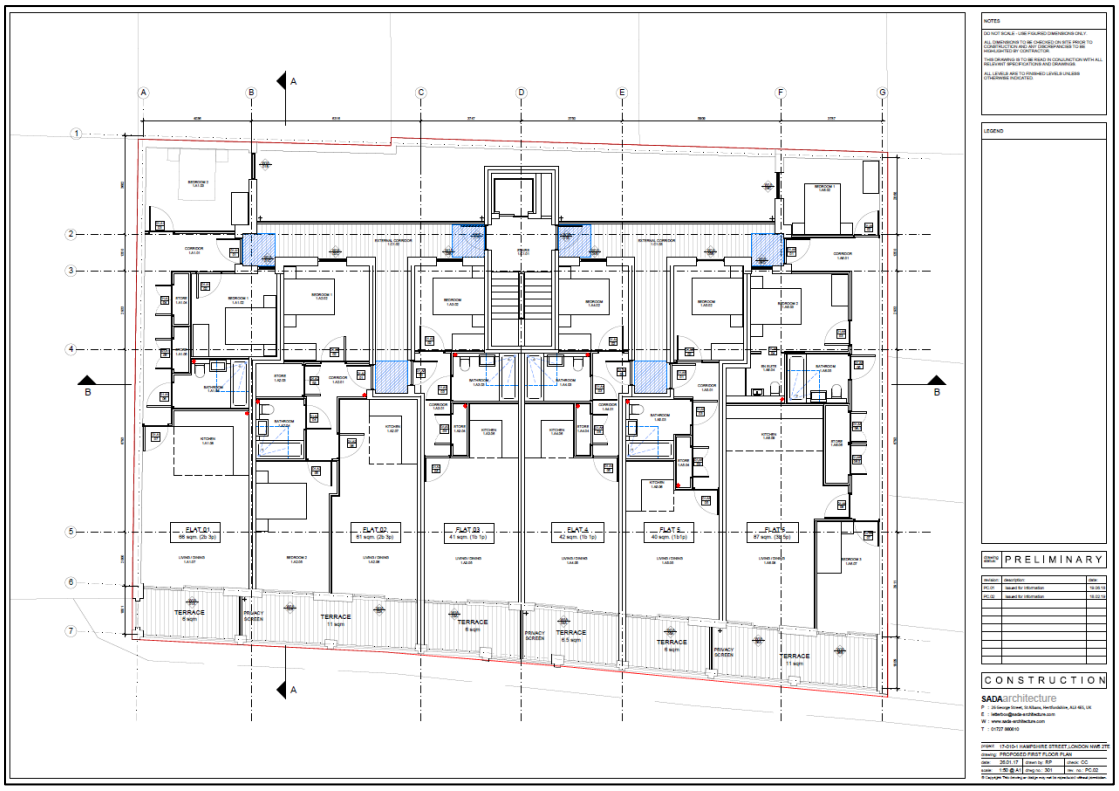
Secure cycle storage will provide 30 storage spaces, in accordance with London Plan 2016.

The flat layouts fulfil the space requirements of the London Mayors Housing SPD 2011 and Lifetime Homes Standards July 2010.

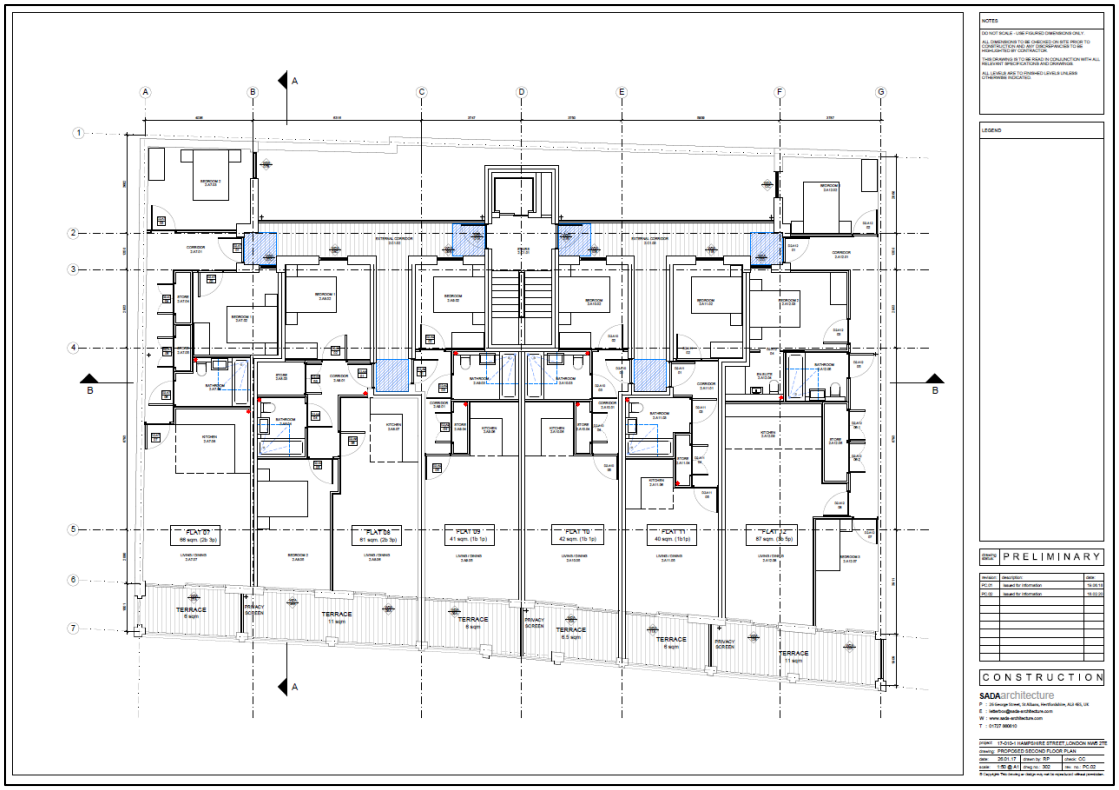
Proposed Site Plan



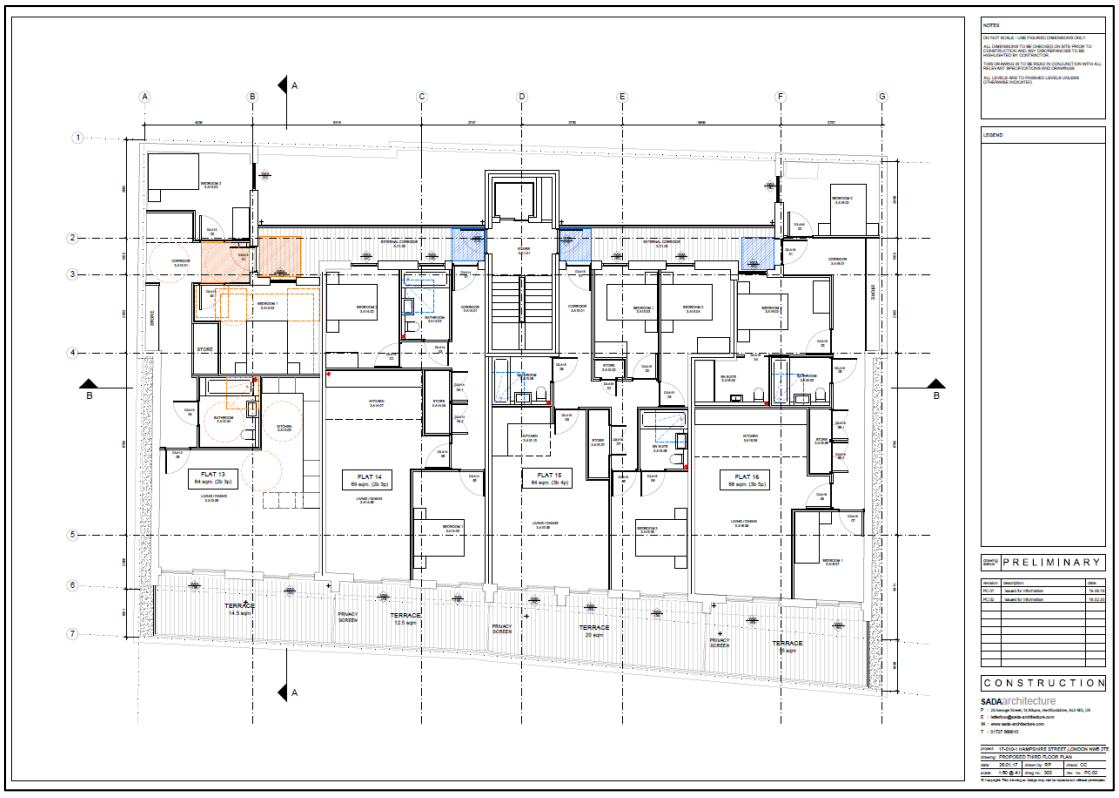
Proposed Ground Floor Plan



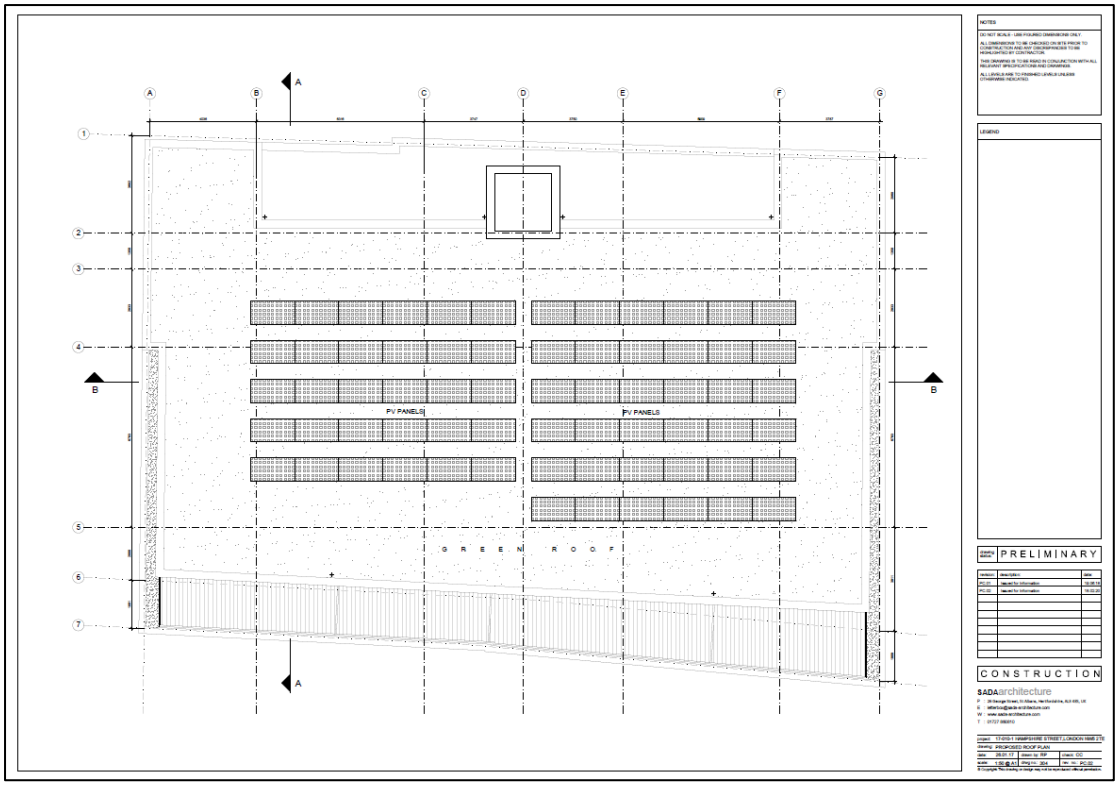
Proposed First Floor Plan



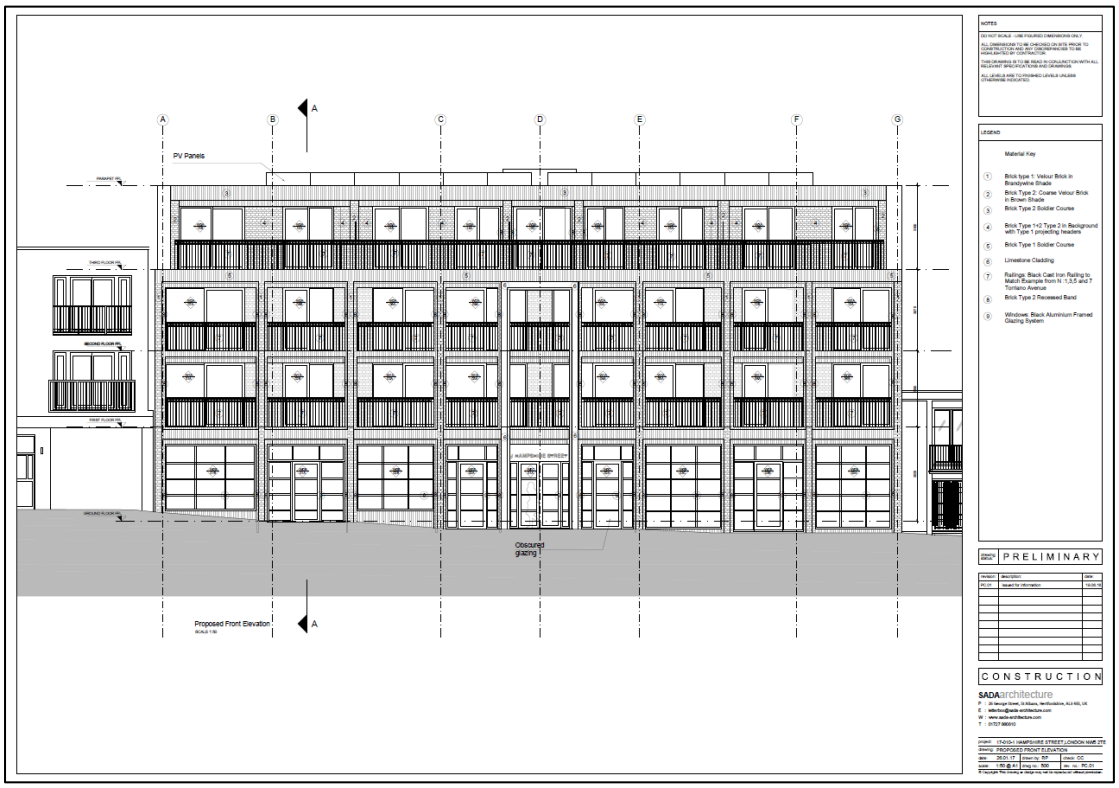
Proposed Second Floor Plan

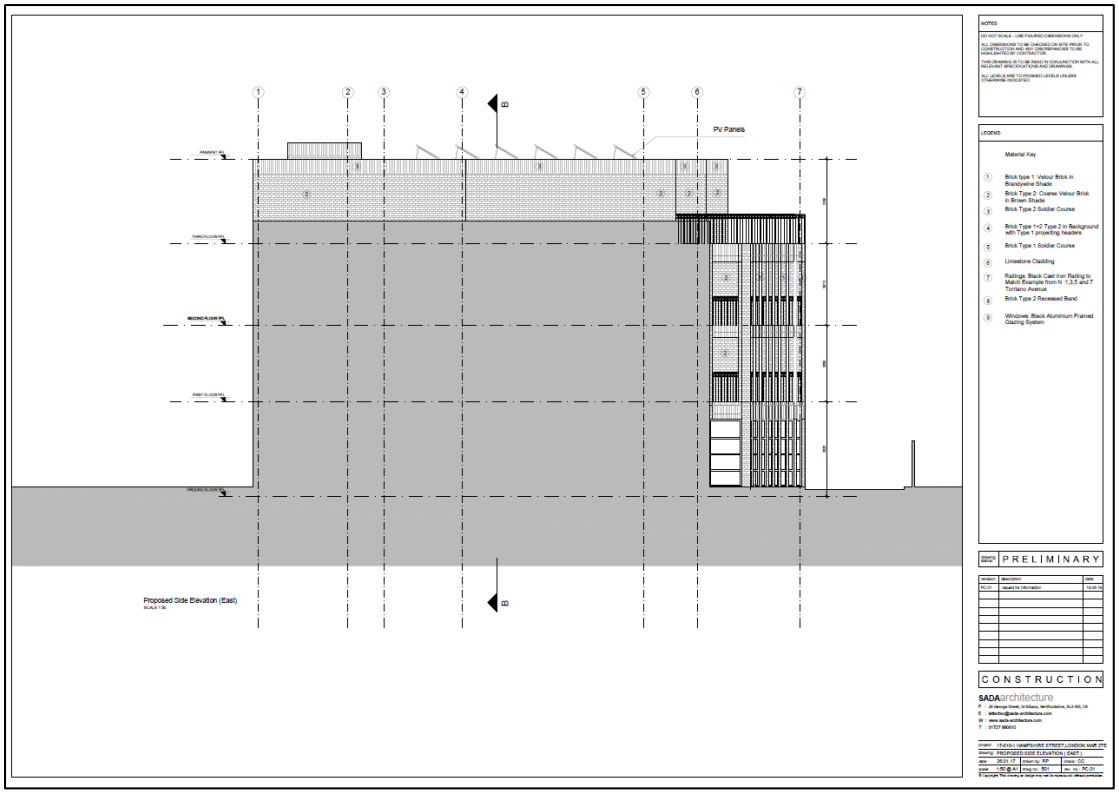


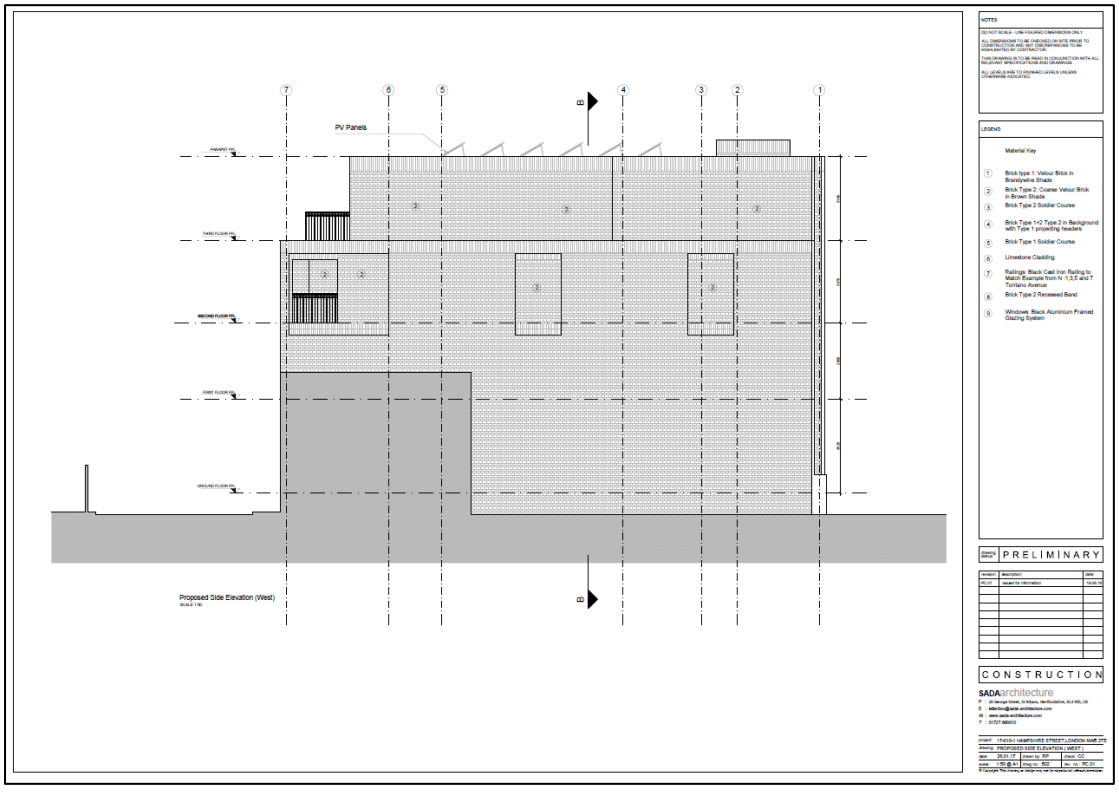
Proposed Third Floor Plan

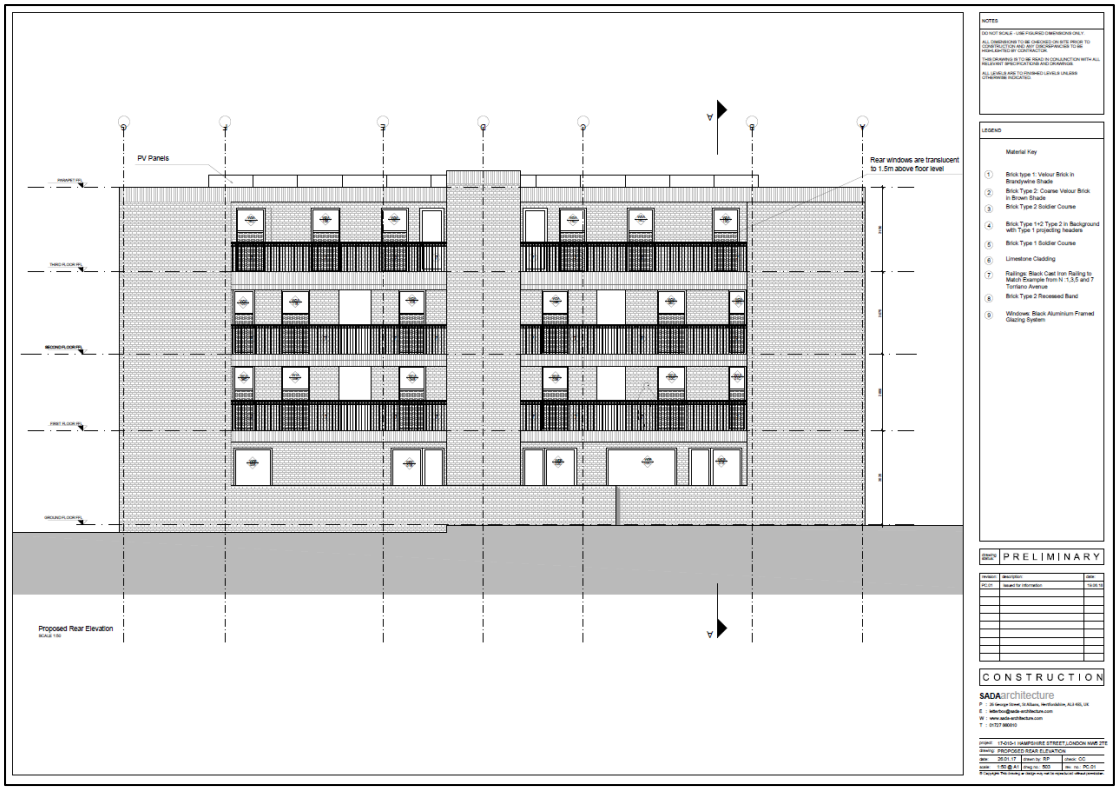


Proposed Roof Plan




PV Panels
Proposed Side Elevation (East)
PRELIMINARY
CONSTRUCTION
SADAarchitecture


PV Panels
Proposed Side Elevation (West)
PRELIMINARY
CONSTRUCTION
SADAarchitecture



Proposed Elevations

Section 3: Energy Efficiency and Renewable Energy Plan

A). Demonstrating the 35% CO_2 Reduction over Part L 2013

As-Designed SAP and NCM calculations have been undertaken in line with the approach developed in the Build Energy Sustainability statement submitted alongside the planning application for the development. Detailed analysis of the performance and specification of these calculations is provided in this section. The calculations themselves can be found in Appendix A to this report.

3.1 The Energy Hierarchy

The energy hierarchy is generally accepted as the most effective way of reducing building carbon emissions.

1. Be lean: use less energy
2. Be clean: supply energy efficiently
3. Be green: use renewable energy
4. Be seen: monitor, verify and report on energy performance

Development proposals should:

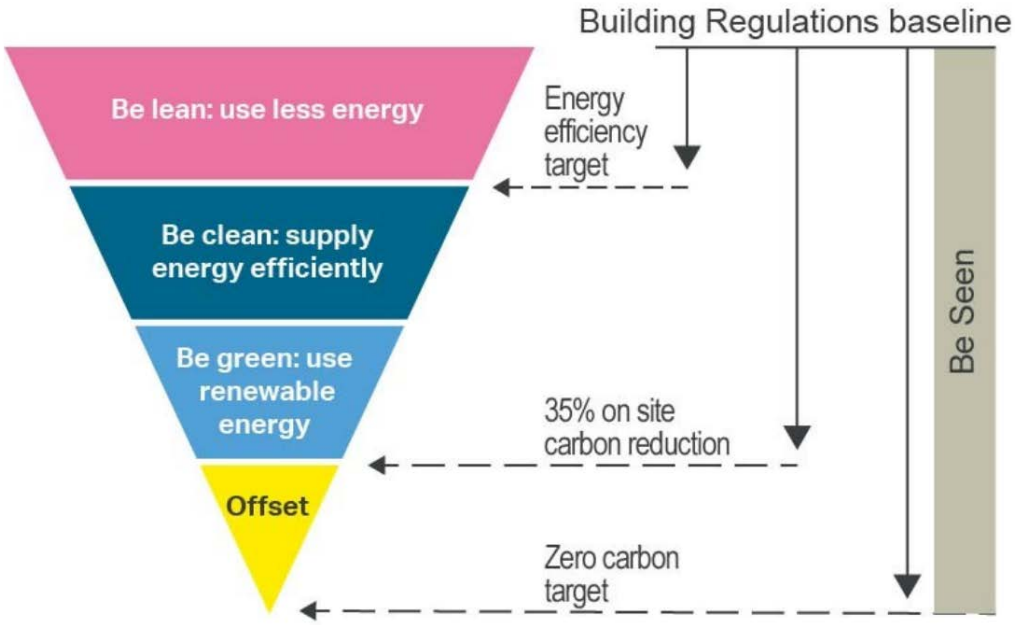


Figure 3.1: The Energy Hierarchy

- ***Reducing energy demand***

The first step in the process of reducing the overall energy used and CO_2 produced by the building is to minimise the energy required to heat it. A well-insulated building envelope and passive design will

reduce the energy requirement for heating and ventilating the building.

- ***Energy efficient systems***

The second step is to specify services and controls, lighting and appliances that are energy efficient and which result in further reduction in energy requirements.

- ***Making use of Low or zero-carbon (LZC) technologies***

When the energy demand has been reduced by implementing the processes of improving the fabric and energy efficiency, then LZC technologies can be employed to reduce the environmental impact of the remaining energy consumption.

- ***Monitoring and reporting***

Ensure comprehensive monitoring and reporting of energy demand and carbon emissions. Major developments are required to undertake this process for at least five years.

3.2 Calculating Baseline Energy Demand

The first step is to calculate a Building Regulations Part L 2013 compliant specification in order to establish baseline emissions for the development. Calculated data using the government's approved methodology (SAP 2012) has been used to establish baseline energy requirements which comply with the 2013 edition of Part L minimum elemental standards.

Sixteen SAP models, one for each flat in the development, have been used at each stage of the hierarchy. These have then been used to produce a 'Block Compliance' Report for the whole residential development with average and total energy and CO_2 consumption calculated on an area-weighted basis as per the Part L guidance.

A summary of the baseline emissions and energy consumption resulting from the SAP modelling are shown in tables 3a and 3b below:

House Type	3a: Baseline Carbon Emissions (tonnes CO_2 per year)								Total Emissions (tonnes CO_2 per year)
	Space Heating (1) *SAP (261)*	Space Heating (2) *SAP (262)*	Secondary Heating *SAP (263)*	Water Heating *SAP (264)*	Space Cooling *SAP (266)*	Pumps & Fans *SAP (267)*	Lighting *SAP (268)*	Additional Allowable Generation	
Flat 1	0.75	0.00	0.00	0.46	0.00	0.02	0.09	0.00	1.31
Flat 2	0.64	0.00	0.00	0.44	0.00	0.02	0.09	0.00	1.18
Flat 3	0.54	0.00	0.00	0.37	0.00	0.02	0.07	0.00	0.99
Flat 4	0.53	0.00	0.00	0.37	0.00	0.02	0.07	0.00	0.98
Flat 5	0.46	0.00	0.00	0.36	0.00	0.02	0.06	0.00	0.90
Flat 6	0.99	0.00	0.00	0.51	0.00	0.02	0.11	0.00	1.63
Flat 7	0.56	0.00	0.00	0.46	0.00	0.02	0.09	0.00	1.13
Flat 8	0.50	0.00	0.00	0.44	0.00	0.02	0.09	0.00	1.04
Flat 9	0.40	0.00	0.00	0.37	0.00	0.02	0.07	0.00	0.86
Flat 10	0.38	0.00	0.00	0.37	0.00	0.02	0.07	0.00	0.83
Flat 11	0.33	0.00	0.00	0.37	0.00	0.02	0.06	0.00	0.77
Flat 12	0.74	0.00	0.00	0.51	0.00	0.02	0.11	0.00	1.38
Flat 13	0.87	0.00	0.00	0.50	0.00	0.02	0.11	0.00	1.50
Flat 14	0.66	0.00	0.00	0.47	0.00	0.02	0.09	0.00	1.23
Flat 15	0.84	0.00	0.00	0.51	0.00	0.02	0.11	0.00	1.47
Flat 16	0.86	0.00	0.00	0.51	0.00	0.02	0.11	0.00	1.50
Total:	**10.05**	**0.00**	**0.00**	**7.02**	**0.00**	**0.28**	**1.36**	**0.00**	**18.71**
								Total:	**18.71**

3b: Total Annual Part L Baseline Regulated Emissions & Fabric Energy Efficiency	
Emissions	**18.71 Tonnes of CO_2**
Energy	**88,324 kWh**

London Plan policy 5.2 (Minimising carbon dioxide emissions) requires that all major residential and non-residential developments endeavour to achieve a 40% improvement on 2010 Part L Building regulations target emission rates. This equates to a 35% improvement over 2013 Part L Building regulations target emission rates.

For major applications received on or after 1st October 2016, the regulated carbon dioxide emissions reduction target for residential development is zero carbon, with at least 35% reduction (against Part L 2013 Building Regulations) achieved through on-site measures. The

remaining regulated carbon emissions (to 100%) are to be offset through cash in lieu contribution via a S106 agreement.

The strategic aim is to reduce carbon emissions overall, so that while planning decisions and monitoring requirements will be underpinned by the targets expressed above, the requirement for energy assessments to include separate details of unregulated emissions is to recognise explicitly the additional contribution that can be made through use of efficient equipment, building controls and good management practices, including green leases. Unregulated emissions are therefore included in the calculations, but are not taken into account when calculating percentage improvement.

The London Plan no longer contains targets for a set contribution from renewable energy following its update in March 2015.

3.3 Emission Reduction Targets (Be Lean and Be Clean)

The first two steps of the energy hierarchy require the reduction of energy consumption in the building through improvements to its fabric and by increasing the efficiency of the building services. This reduces the energy required to run the building and thus the emissions associated with that energy use. 2013 Part L1A is already very stringent in terms of fabric performance targets, the reduction possible from further improvement to the building fabric and services is limited when compared with those which may be expected from buildings constructed to earlier versions of Building Regulations.

In this case, improved floor, roof, wall and window/door u-values will further reduce energy losses through the building fabric and the incorporation of efficient gas combi boilers will improve the mechanical efficiencies. Utilising waste water heat recovery also contributes to the improved carbon emissions and energy demand.

3c: Be lean & be clean improved specification	
Element	**Residential Specification**
External wall	0.18W/m²K
Corridor wall	0.16W/m²K
Party wall	0W/m²K (assuming fully filled cavity)
Roof	0.11W/m²K
Floor to commercial	0.13W/m²K
Windows/Glazed Doors	1.40W/m²K
Solid Door	1.00W/m²K
Air Permeability	5.0m³/m²/hr

Ventilation	Intermittent extract fan
Thermal Bridging	Calculated
Lighting	100% low energy lamps
Space Heating & DHW	89% efficient mains gas combi boiler
Emitters	Underfloor heating
Controls	Time & temp zone control
Shower technology	Waste Water Heat recovery system

House Type	3d: Be lean & be clean Carbon Emissions (tonnes CO_2 per year)								Total Emissions (tonnes CO_2 per year)
	Space Heating (1) *SAP (261)*	Space Heating (2) *SAP (262)*	Secondary Heating *SAP (263)*	Water Heating *SAP (264)*	Space Cooling *SAP (266)*	Pumps & Fans *SAP (267)*	Lighting *SAP (268)*	Additional Allowable Generation	
Flat 1	0.74	0.00	0.00	0.39	0.00	0.02	0.09	0.00	1.24
Flat 2	0.64	0.00	0.00	0.38	0.00	0.02	0.08	0.00	1.12
Flat 3	0.54	0.00	0.00	0.32	0.00	0.02	0.06	0.00	0.94
Flat 4	0.55	0.00	0.00	0.32	0.00	0.02	0.06	0.00	0.95
Flat 5	0.46	0.00	0.00	0.32	0.00	0.02	0.06	0.00	0.85
Flat 6	0.95	0.00	0.00	0.43	0.00	0.02	0.11	0.00	1.52
Flat 7	0.59	0.00	0.00	0.40	0.00	0.02	0.09	0.00	1.09
Flat 8	0.53	0.00	0.00	0.38	0.00	0.02	0.08	0.00	1.01
Flat 9	0.45	0.00	0.00	0.32	0.00	0.02	0.06	0.00	0.85
Flat 10	0.43	0.00	0.00	0.33	0.00	0.02	0.06	0.00	0.83
Flat 11	0.33	0.00	0.00	0.32	0.00	0.02	0.06	0.00	0.73
Flat 12	0.77	0.00	0.00	0.43	0.00	0.02	0.11	0.00	1.34
Flat 13	0.84	0.00	0.00	0.43	0.00	0.02	0.11	0.00	1.40
Flat 14	0.64	0.00	0.00	0.40	0.00	0.02	0.09	0.00	1.15
Flat 15	0.88	0.00	0.00	0.43	0.00	0.02	0.11	0.00	1.44
Flat 16	0.85	0.00	0.00	0.44	0.00	0.02	0.11	0.00	1.42
Total:	**10.21**	**0.00**	**0.00**	**6.06**	**0.00**	**0.28**	**1.33**	**0.00**	**17.87**
								Total:	**17.87**

3e: Total Annual be lean & be clean Regulated Emissions & Energy	
Emissions	**17.87 Tonnes of CO_2**
Energy	**84,347 kWh**

3.5 CO_2 reduction through the use of LZC technology (Be Green)

3f: Target contribution from low carbon & renewable technologies.	
Total 'baseline' Part L 2013 compliant CO_2 emissions (Tonnes CO_2 per year)	21.21
Total 'be lean, be clean' Part L 2013 compliant CO_2 emissions (Tonnes CO_2 per year)	20.31
Target CO_2 emissions (Tonnes CO_2 per year) to achieve 35% improvement over Part L 2013	**13.79**
Required reduction from renewable or low carbon technologies. (Tonnes CO_2 per year)	**-6.52**

In addition to efficient gas boilers, it is proposed to utilise roof space at the highest level to install an array of PV panels. Drawings indicate that space is provided for 66 panels. Based on a 340 watt PV panel with assumed no/little over shading 47 panels will produce 15.98kWp, or an estimated 13,818kWh, offsetting 7.17 tonnes of CO_2 per annum. The remaining 19 panels are allocated to the commercial units and landlord common spaces.

3g: Be lean, be clean & be green improved specification.	
Element	**Residential Specification**
External wall	0.18W/m²K
Corridor wall	0.16W/m²K
Party wall	0W/m²K (assuming fully filled cavity)
Roof	0.11W/m²K
Floor to commercial	0.13W/m²K
Windows/Glazed Doors	1.40W/m²K
Solid Door	1.00W/m²K
Air Permeability	5.0m³/m²/hr
Ventilation	Intermittent extract fan
Thermal Bridging	Calculated
Lighting	100% low energy lamps
Space Heating & DHW	89% efficient mains gas combi boiler
Emitters	Underfloor heating
Controls	Time & temp zone control
Shower technology	Waste Water Heat recovery system
Renewable generators	**47 x 340W PV panels**

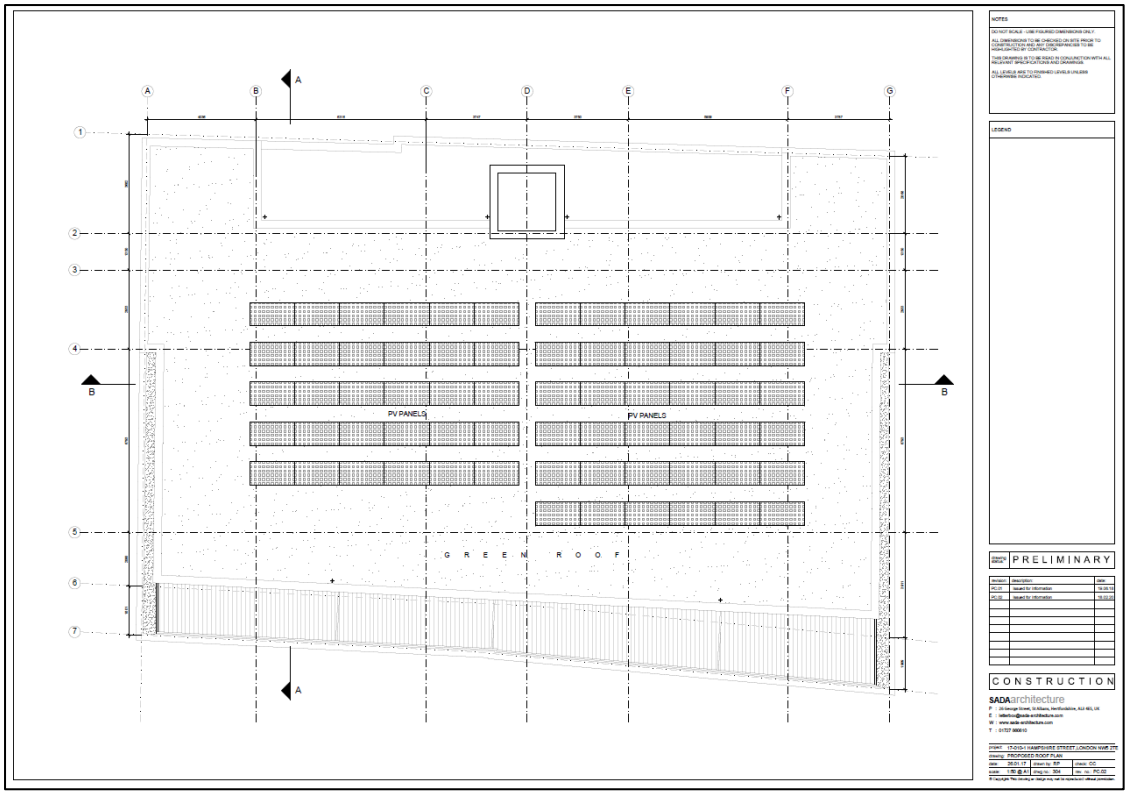


Figure 3.5 Proposed roof top PV layout

3h: Total annual be lean, be clean & be green regulated residential emissions & energy	
Emissions	**13.13 Tonnes of CO_2**
Energy	**70,529 kWh**

House Type	3i: Be green Carbon Emissions (tonnes CO_2 per year)								Total Emissions (tonnes CO_2 per year)
	Space Heating (1) *SAP (261)*	Space Heating (2) *SAP (262)*	Secondary Heating *SAP (263)*	Water Heating *SAP (264)*	Space Cooling *SAP (266)*	Pumps & Fans *SAP (267)*	Lighting *SAP (268)*	Additional Allowable Generation	
Flat 1	0.76	0.00	0.00	0.41	0.00	0.04	0.20	-0.45	0.95
Flat 2	0.65	0.00	0.00	0.39	0.00	0.04	0.19	-0.45	0.83
Flat 3	0.56	0.00	0.00	0.33	0.00	0.04	0.13	-0.45	0.61
Flat 4	0.57	0.00	0.00	0.33	0.00	0.04	0.13	-0.45	0.63
Flat 5	0.47	0.00	0.00	0.33	0.00	0.04	0.12	-0.45	0.51
Flat 6	0.98	0.00	0.00	0.44	0.00	0.04	0.25	-0.45	1.27
Flat 7	0.60	0.00	0.00	0.41	0.00	0.04	0.20	-0.45	0.80
Flat 8	0.55	0.00	0.00	0.39	0.00	0.04	0.19	-0.45	0.72
Flat 9	0.46	0.00	0.00	0.33	0.00	0.04	0.13	-0.45	0.52
Flat 10	0.44	0.00	0.00	0.34	0.00	0.04	0.13	-0.45	0.50
Flat 11	0.34	0.00	0.00	0.33	0.00	0.04	0.12	-0.45	0.39
Flat 12	0.80	0.00	0.00	0.45	0.00	0.04	0.25	-0.45	1.08
Flat 13	0.87	0.00	0.00	0.45	0.00	0.04	0.24	-0.45	1.14
Flat 14	0.66	0.00	0.00	0.41	0.00	0.04	0.20	-0.45	0.86
Flat 15	0.91	0.00	0.00	0.45	0.00	0.04	0.24	-0.45	1.18
Flat 16	0.87	0.00	0.00	0.45	0.00	0.04	0.25	-0.45	1.16
Total:	**10.50**	**0.00**	**0.00**	**6.23**	**0.00**	**0.62**	**2.95**	**-7.17**	**13.13**
								Total:	**13.13**

Table 3j: Anticipated reduction in L1A emissions & energy use		
	kWh per year	**Tonnes CO_2 per year**
Total 'Baseline' annual figures	88,324	21.21
Total 'be lean, be clean' annual figures	84,347	20.31
Total 'be lean, be clean & be green' annual figures	70,529	13.13
Total reduction over Baseline	**20.15%**	**38.10%**

The approach that has been proposed for the development reduces residential energy consumption by 20.15% and CO_2 emissions by 38.10% when compared to Part L1A 2013 benchmarks.

3.6 Commercial assessment

The application includes a three ground commercial units. It is proposed to assess the potential energy consumption and subsequent CO_2 emissions using the same energy hierarchy approach to reduce emissions by a similar percentage to that demonstrated in the residential element.

Using NCM commercial calculations we are able to determine the anticipated kWh and CO_2 from this space, results shown in table 3l, below.

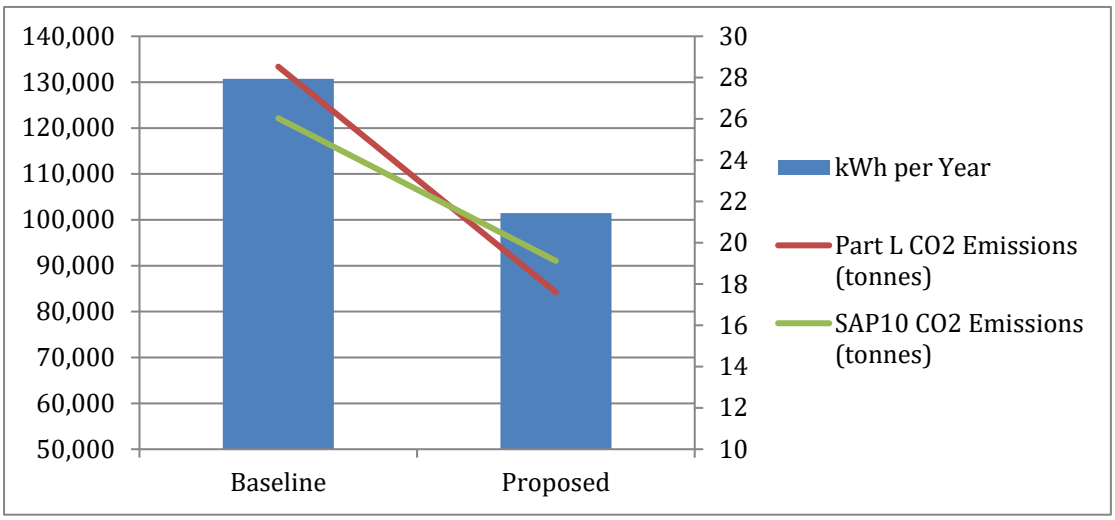
Table 3l: Anticipated L2A emissions & energy use		
	kWh per year	**Tonnes CO_2 per year**
Baseline annual figures	42,408	7.32
Be lean & be clean figures	33,431	5.77
Be green figures	30,934	4.47
Total reduction over Baseline	**27.06%**	**38.93%**

Advanced lighting controls have a significant impact on energy consumption in the non-residential unit as lighting accounts for a large percentage of total energy consumption in commercial spaces of this type it therefore needs careful consideration when specifying. Improved lighting, along with high specification U-values, efficient heating and hot water and the inclusion of 3.2kWp of PV, 10 x 320w panels, pitched to 30degress, orientated south, achieves the required reduction as specified in the S.106 agreement 2.2a).

3.7 Combined Residential & Commercial performance

The information from sections 3.5 & 3.6 above have been combined to create one overall performance for the whole development – including both residential and commercial elements. Table 3m, below, contains details of the overall energy and CO_2 reductions achieved across the development.

Table 3m: Total anticipated reduction in regulated emissions and energy use					
		Part L		SAP 10	
		kWh/year	Tonnes CO_2/year	kWh/year	Tonnes CO_2/year
Residential	Baseline	88,324	21.21	88,324	18.71
	Proposed	70,529	13.13	70,529	14.65
Commercial	Baseline	42,408	7.32	42,408	7.32
	Proposed	30,934	4.47	30,934	4.47
Combined	Baseline	130,732	28.53	130,732	26.03
	Proposed	101,463	17.60	101,463	19.12
Reduction over Part L		**22.39%**	**38.31%**	**22.39%**	**26.55%**



This development, therefore, meets the Section 106 and London Plan targets for at least a 35% reduction in regulated emissions on site at Design Stage.

B). Details of 30% CO_2 Reduction from renewable technologies

Section A, above, confirms how the development will achieve a 38% reduction in CO_2 based on the full Design Stage SAP and NCM calculations that have been undertaken by relevant professionals. An additional iteration of these has also been undertaken excluding the proposed low and zero carbon technologies (PV). The baseline of Part L 2013 compliance, these additional 'be lean, be clean' SAPs & NCM calculations and the final full SAP & NCM calculations can then be compared. This demonstrates that the total CO_2 reduction in emissions

provided by the proposed PV low and zero carbon technology is 32.5% - see Table 1b below.

Table 1b: CO_2 reduction from low carbon & renewable technologies.	
Total 'baseline' Part L 2013 compliant CO_2 emissions (Tonnes CO_2 per year)	28.53
Total 'be lean, be clean' Part L 2013 compliant CO_2 emissions (Tonnes CO_2 per year)	26.08
Total 'be lean, be clean, be green' Part L 2013 compliant CO_2 emissions (Tonnes CO_2 per year)	**17.60**
Achieved reduction from renewable or low carbon technologies. (Tonnes CO_2 per year)	**8.48**
Achieved reduction from renewable or low carbon technologies. (% over 'be lean, be clean')	**32.5%**

Appendix B to this report contains a drawing showing the location of the proposed PV panels on the roof of the building.

C). Separate Metering of LZC Technologies

The proposed low and zero carbon technology for the development is photovoltaic panels (PV). The installation of this system will be undertaken in line with MCS standards and following the additional guidance of the Smart Export Guarantee[2] scheme. In order to monitor the generation of the PV array a dedicated meter will be installed to measure how much energy is generated by the PV array. In addition, in order to comply with the SEG requirements an export meter will also be installed, which will enable analysis of how much of energy is being used within the development and how much is being exported.

D). Building Management System

As this development is comprised on individual apartments and commercial units with each having its own dedicated heating system there is no centralised control system or plant present. As such a single Building Management System cannot be provided.

E). Local Heat Networks

London Plan Policy 5.6 requires that connection to existing decentralised energy networks be considered. However, as can be seen from the

[2] https://www.ofgem.gov.uk/environmental-programmes/smart-export-guarantee-seg/about-smart-export-guarantee-seg

below extract from the London Heat Map, the site appears to be too far away from any potential or existing heating networks for this technology to be feasible.

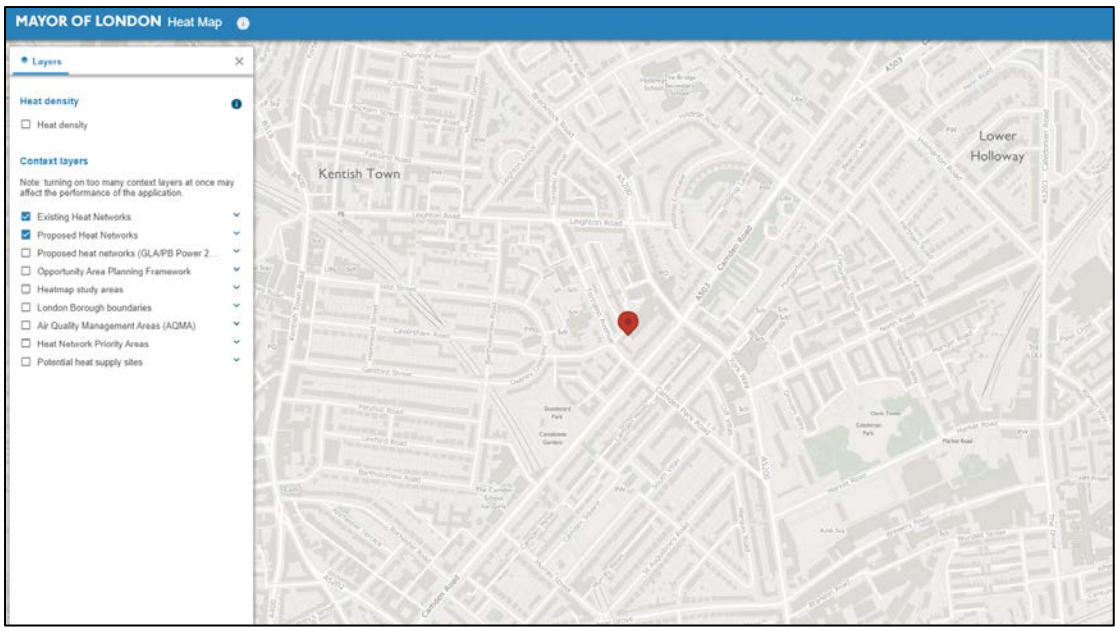


Figure 3.2: London Heat Map

As there are no visible existing or proposed heat networks in proximity to the site no provision has been made in the development for connection to a district heating network.

In addition, given the strides the UK has made in decarbonising the electricity grid the lowest CO_2 heating system available at present are heat pumps. As the additional energy taken to run a communal heating system is not recovered through efficiency of scale until around 50 dwellings are being served, the proposed development is not large enough to benefit from a communal heating system. As such, retrofitting of renewable heating can be more simply achieved in this development through the replacement of the individual gas boilers with individual heat pumps at a later date. This is also likely to lead to a greater CO_2 reduction than connecting into a district heating system.

F). Design Stage SAP & NCM Calculations

Full Design Stage SAP calculations have been undertaken by Andrew Gwynne for all residential units in the proposed development. Andrew Gwynne is an accredited and licenced On-Construction Domestic Energy Assessor (OCDEA) through Elmhurst Energy Services Ltd for the production of SAP calculations and associated EPCs.

Full Design Stage NCM calculations have been produced using IES Virtual Environment by Paul Shipley for all commercial units in the

development. Paul Shipley is accredited via CIBSE for the production of commercial EPCs for buildings up to and including Level 5.

The Design Stage SAP compliance reports & full SAP calculations and the As-Designed BRUKL document can be found in Appendix A to this report. These calculations are based on the full specification detailed in Section A, 3.5 above.

G). As-Built Stage SAP & NCM Calculations

These will be produced on project completion and provided via the mechanism detailed in Section H, below.

H). Provision of Future Information

It is proposed that the Owner of the development will provide additional information as required to the 'Planning Obligations Officer' as detailed in the Section 106 agreement under Definition 2.29. This will be done at As-Built Stage, in line with Section G, above.

Appendix A

Design Stage SAP & NCM Calculations

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name **Shell and Core**

Hampshire Street

As designed

Date: Mon Mar 16 11:15:29 2020

Administrative information

Building Details

Address: 1 Hampshire Street, LONDON, NW5 2TE

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.12

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.12

BRUKL compliance check version: v5.6.a.1

Owner Details

Name: ----

Telephone number: ---

Address: ---, ---, ---

Certifier details

Name: MES Building Solutions

Telephone number: 01636 653 055

Address: Newark Beacon, Cafferata Way, NEWARK, NG24 2TN

Criterion 1: The calculated CO_2 emission rate for the building must not exceed the target

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	18
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	18
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	11
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	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.18	0.18	RM000002:Surf[1]
Floor	0.25	0.13	0.13	RM000002:Surf[0]
Roof	0.25	0.11	0.11	RM000005:Surf[1]
Windows***, roof windows, and rooflights	2.2	1.4	1.4	RM000005:Surf[2]
Personnel doors	2.2	-	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$]

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]

$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

* 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
$m^3/(h.m^2)$ 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- LTHW NG Rads M Ext

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	-	0.2	0	-
Standard value	0.91*	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 gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

2- LTHW NG Rads NV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	-	0.2	0	-
Standard value	0.91*	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 gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

"No HWS in project, or hot water is provided by HVAC system"

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	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
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	**Zone**	**Standard**
WC/Shower Room - Commercial 3	0.3	-	-	-	-	-	-	-	-	-	N/A
WC - Commercial 3	0.3	-	-	-	-	-	-	-	-	-	N/A
Acc WC - Commercial 2	0.3	-	-	-	-	-	-	-	-	-	N/A
WC - Commercial 2	0.3	-	-	-	-	-	-	-	-	-	N/A
Acc WC - Commericial 1	0.3	-	-	-	-	-	-	-	-	-	N/A
WC - Commercial 1	0.3	-	-	-	-	-	-	-	-	-	N/A

Shell and core configuration

Zone	Assumed shell?
0.C1.02 Resi. Waste Store	NO
WC/Shower Room - Commercial 3	NO
0.B3.01 Commercial Unit 3	NO
WC - Commercial 3	NO

Shell and core configuration

Zone	Assumed shell?
0.C1.03 Cycle Store	NO
0.C1.02 Plant	NO
Acc WC - Commercial 2	NO
0.B2.01 Commercial Unit 2	NO
WC - Commercial 2	NO
Acc WC - Commericial 1	NO
0.B1.01 Commercial Unit 1	NO
WC - Commercial 1	NO

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
0.C1.02 Resi. Waste Store	85	-	-	17
WC/Shower Room - Commercial 3	-	85	-	48
0.B3.01 Commercial Unit 3	85	-	-	960
WC - Commercial 3	-	85	-	36
0.C1.03 Cycle Store	85	-	-	397
0.C1.02 Plant	85	-	-	48
Acc WC - Commercial 2	-	85	-	50
0.B2.01 Commercial Unit 2	85	-	-	664
WC - Commercial 2	-	85	-	37
Acc WC - Commericial 1	-	85	-	48
0.B1.01 Commercial Unit 1	85	-	-	820
WC - Commercial 1	-	85	-	37

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?
0.B3.01 Commercial Unit 3	NO (-62.2%)	NO
0.C1.03 Cycle Store	NO (-44.9%)	NO
0.B2.01 Commercial Unit 2	NO (-2.1%)	NO
0.B1.01 Commercial Unit 1	NO (-53.9%)	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]	406.6	406.6
External area [m²]	840.5	840.5
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	5	3
Average conductance [W/K]	253.55	388.53
Average U-value [W/m²K]	0.3	0.46
Alpha value* [%]	10.13	10

* 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
100	**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	31.48	35.68
Cooling	0	0
Auxiliary	2.61	1.9
Lighting	10.48	17.26
Hot water	2.96	2.81
Equipment*	40.89	40.89
TOTAL**	**47.53**	**57.65**

* 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	6.14	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	92.02	110.75
Primary energy* [kWh/m²]	82.22	104.3
Total emissions [kg/m²]	11	18

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

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] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	115.8	0	39.6	0	2.1	0.81	0	0.91	0
	Notional	135.8	0	43.8	0	1	0.86	0	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	31.1	0	10.7	0	13.3	0.81	0	0.91	0
	Notional	74.8	0	24.1	0	15.2	0.86	0	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	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] = Cooling 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

Key Features

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

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.18	RM000002:Surf[1]
Floor	0.2	0.13	RM000002:Surf[0]
Roof	0.15	0.11	RM000005:Surf[1]
Windows, roof windows, and rooflights	1.5	1.4	RM000005:Surf[2]
Personnel doors	1.5	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = 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

BASIC COMPLIANCE REPORT
Calculation Type: New Build (As Designed)

Property Reference	Flat 01 - 1 Hampshire St.	**Issued on Date**	28/05/2020
Assessment Reference	AD - Gas Combi + PV	**Prop Type Ref**	
Property	Flat 1, 1 Hampshire Street, London, NW5 2TE		

SAP Rating	82 B	**DER**	14.41	**TER**	22.30
Environmental	90 B	**% DER<TER**	35.39		
CO_2 Emissions (t/year)	0.70	**DFEE**	52.27	**TFEE**	63.71
General Requirements Compliance	Pass	**% DFEE<TFEE**	17.95		

Assessor Details	Mr. Andrew Gwynne, Andrew Gwynne, Tel: 01636 653055, andrew.gwynne@mesenergyservices.co.uk	**Assessor ID**	P741-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	22.30	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	14.41	$kgCO_2/m^2$	Pass
	-7.89 (-35.4%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	63.71	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	52.27	$kWh/m^2/yr$	
	-11.4 (-17.9%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.07 (max. 0.25)	0.07 (max. 0.70)	Pass
Openings	1.33 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.126

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Boiler system with radiators or underfloor - Mains gas Data from manufacturer tbc tbc Combi boiler Efficiency: 89.0% SEDBUK2009 Minimum: 88.0%	Pass

Secondary heating system	None		
5 Cylinder insulation			
Hot water storage	No cylinder		
6 Controls			
Space heating controls	Time and temperature zone control		Pass
Hot water controls	No cylinder		
Boiler interlock	Yes		Pass
7 Low energy lights			
Percentage of fixed lights with low-energy fittings	100	%	
Minimum	75	%	Pass
8 Mechanical ventilation			
Not applicable			

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature			
Overheating risk (Thames Valley)	Slight		Pass
Based on:			
Overshading	Average		
Windows facing North	1.56 m², No overhang		
Windows facing East	2.40 m², No overhang		
Air change rate	6.00 ach		
Blinds/curtains	None		

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Solid Wall	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability			
Air permeability at 50 pascals	5.00 (design value)		
Maximum	10.0		Pass
10 Key features			
Party wall U-value	0.00	W/m²K	
Door U-value	1.00	W/m²K	
Photovoltaic array	1.00	kW	

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BASIC COMPLIANCE REPORT
Calculation Type: New Build (As Designed)

Property Reference	Flat 02 - 1 Hampshire St.	**Issued on Date**	28/05/2020
Assessment Reference	AD - Gas Combi + PV	**Prop Type Ref**	
Property	Flat 2, 1 Hampshire Street, London, NW5 2TE		

SAP Rating	88 B	**DER**	13.61	**TER**	22.11
Environmental	91 B	**% DER<TER**	38.45		
CO_2 Emissions (t/year)	0.59	**DFEE**	49.30	**TFEE**	59.71
General Requirements Compliance	Pass	**% DFEE<TFEE**	17.43		

Assessor Details	Mr. Andrew Gwynne, Andrew Gwynne, Tel: 01636 653055, andrew.gwynne@mesenergyservices.co.uk	**Assessor ID**	P741-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	22.11	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	13.61	$kgCO_2/m^2$	Pass
	-8.50 (-38.4%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	59.71	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	49.30	$kWh/m^2/yr$	
	-10.4 (-17.4%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.07 (max. 0.25)	0.07 (max. 0.70)	Pass
Openings	1.34 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.129

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Boiler system with radiators or underfloor - Mains gas Data from manufacturer tbc tbc Combi boiler Efficiency: 89.0% SEDBUK2009 Minimum: 88.0%	Pass

Secondary heating system	None		
5 Cylinder insulation			
Hot water storage	No cylinder		
6 Controls			
Space heating controls	Time and temperature zone control		Pass
Hot water controls	No cylinder		
Boiler interlock	Yes		Pass
7 Low energy lights			
Percentage of fixed lights with low-energy fittings	100	%	
Minimum	75	%	Pass
8 Mechanical ventilation			
Not applicable			

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)	Not significant		Pass
Based on:			
Overshading	Average		
Windows facing North	2.57 m², No overhang		
Air change rate	6.00 ach		
Blinds/curtains	None		

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Solid Wall	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)		
Maximum	10.0		Pass

10 Key features

Party wall U-value	0.00	W/m²K
Door U-value	1.00	W/m²K
Photovoltaic array	1.00	kW

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BASIC COMPLIANCE REPORT
Calculation Type: New Build (As Designed)

Property Reference	Flat 03 - 1 Hampshire St.	**Issued on Date**	28/05/2020
Assessment Reference	AD - Gas Combi + PV	**Prop Type Ref**	
Property	Flat 3, 1 Hampshire Street, London, NW5 2TE		

SAP Rating	88 B	**DER**	14.80	**TER**	27.29
Environmental	92 A	**% DER<TER**	45.78		
CO_2 Emissions (t/year)	0.43	**DFEE**	60.67	**TFEE**	73.89
General Requirements Compliance	Pass	**% DFEE<TFEE**	17.89		

Assessor Details	Mr. Andrew Gwynne, Andrew Gwynne, Tel: 01636 653055, andrew.gwynne@mesenergyservices.co.uk	**Assessor ID**	P741-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	27.29	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	14.80	$kgCO_2/m^2$	Pass
	-12.49 (-45.8%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	73.89	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	60.67	$kWh/m^2/yr$	
	-13.2 (-17.9%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.08 (max. 0.25)	0.12 (max. 0.70)	Pass
Openings	1.32 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.128

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Boiler system with radiators or underfloor - Mains gas Data from manufacturer tbc tbc Combi boiler Efficiency: 89.0% SEDBUK2009 Minimum: 88.0%	Pass

Secondary heating system	None		
5 Cylinder insulation			
Hot water storage	No cylinder		
6 Controls			
Space heating controls	Time and temperature zone control		Pass
Hot water controls	No cylinder		
Boiler interlock	Yes		Pass
7 Low energy lights			
Percentage of fixed lights with low-energy fittings	100	%	
Minimum	75	%	Pass
8 Mechanical ventilation			
Not applicable			

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature			
Overheating risk (Thames Valley)	Slight		Pass
Based on:			
Overshading	Average		
Windows facing North	2.40 m², No overhang		
Air change rate	6.00 ach		
Blinds/curtains	None		

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Solid Wall	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability			
Air permeability at 50 pascals	5.00 (design value)		
Maximum	10.0		Pass
10 Key features			
Party wall U-value	0.00	W/m²K	
Door U-value	1.00	W/m²K	
Photovoltaic array	1.00	kW	

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BASIC COMPLIANCE REPORT
Calculation Type: New Build (As Designed)

Property Reference	Flat 04 - 1 Hampshire St.	**Issued on Date**	28/05/2020
Assessment Reference	AD - Gas Combi + PV	**Prop Type Ref**	
Property	Flat 4, 1 Hampshire Street, London, NW5 2TE		

SAP Rating	88 B	**DER**	14.87	**TER**	26.49
Environmental	92 A	**% DER<TER**	43.86		
CO_2 Emissions (t/year)	0.44	**DFEE**	60.44	**TFEE**	70.68
General Requirements Compliance	Pass	**% DFEE<TFEE**	14.49		

Assessor Details	Mr. Andrew Gwynne, Andrew Gwynne, Tel: 01636 653055, andrew.gwynne@mesenergyservices.co.uk	**Assessor ID**	P741-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	26.49	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	14.87	$kgCO_2/m^2$	Pass
	-11.62 (-43.9%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	70.68	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	60.44	$kWh/m^2/yr$	
	-10.3 (-14.6%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.13 (max. 0.25)	0.13 (max. 0.70)	Pass
Openings	1.32 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.158

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Boiler system with radiators or underfloor - Mains gas Data from manufacturer tbc tbc Combi boiler Efficiency: 89.0% SEDBUK2009 Minimum: 88.0%	Pass

Secondary heating system	None		
5 Cylinder insulation			
Hot water storage	No cylinder		
6 Controls			
Space heating controls	Time and temperature zone control		Pass
Hot water controls	No cylinder		
Boiler interlock	Yes		Pass
7 Low energy lights			
Percentage of fixed lights with low-energy fittings	100	%	
Minimum	75	%	Pass
8 Mechanical ventilation			
Not applicable			

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature			
Overheating risk (Thames Valley)	Slight		Pass
Based on:			
Overshading	Average		
Windows facing North	2.40 m², No overhang		
Air change rate	6.00 ach		
Blinds/curtains	None		

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Solid Wall	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability			
Air permeability at 50 pascals	5.00 (design value)		
Maximum	10.0		Pass
10 Key features			
Party wall U-value	0.00	W/m²K	
Door U-value	1.00	W/m²K	
Photovoltaic array	1.00	kW	

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BASIC COMPLIANCE REPORT
Calculation Type: New Build (As Designed)

mes buildingsolutions
Part of the FOCUS consultancy group

Property Reference	Flat 05 - 1 Hampshire St.	**Issued on Date**	28/05/2020
Assessment Reference	AD - Gas Combi + PV	**Prop Type Ref**	
Property	Flat 5, 1 Hampshire Street, London, NW5 2TE		

SAP Rating	89 B	**DER**	12.93	**TER**	25.57
Environmental	93 A	**% DER<TER**	49.43		
CO_2 Emissions (t/year)	0.36	**DFEE**	54.08	**TFEE**	66.11
General Requirements Compliance	Pass	**% DFEE<TFEE**	18.20		

Assessor Details	Mr. Andrew Gwynne, Andrew Gwynne, Tel: 01636 653055, andrew.gwynne@mesenergyservices.co.uk	**Assessor ID**	P741-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	25.57	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	12.93	$kgCO_2/m^2$	Pass
	-12.64 (-49.4%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	66.11	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	54.08	$kWh/m^2/yr$	
	-12.0 (-18.2%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.09 (max. 0.25)	0.13 (max. 0.70)	Pass
Openings	1.31 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.159

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Boiler system with radiators or underfloor - Mains gas Data from manufacturer tbc tbc Combi boiler Efficiency: 89.0% SEDBUK2009 Minimum: 88.0%	Pass

Secondary heating system	None		
5 Cylinder insulation			
Hot water storage	No cylinder		
6 Controls			
Space heating controls	Time and temperature zone control		Pass
Hot water controls	No cylinder		
Boiler interlock	Yes		Pass
7 Low energy lights			
Percentage of fixed lights with low-energy fittings	100	%	
Minimum	75	%	Pass
8 Mechanical ventilation			
Not applicable			

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature			
Overheating risk (Thames Valley)	Slight		Pass
Based on:			
Overshading	Average		
Windows facing North	2.57 m², No overhang		
Air change rate	6.00 ach		
Blinds/curtains	None		

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Solid Wall	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability			
Air permeability at 50 pascals	5.00 (design value)		
Maximum	10.0		Pass
10 Key features			
Party wall U-value	0.00	W/m²K	
Door U-value	1.00	W/m²K	
Photovoltaic array	1.00	kW	

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BASIC COMPLIANCE REPORT
Calculation Type: New Build (As Designed)

Property Reference	Flat 06 - 1 Hampshire St.	**Issued on Date**	28/05/2020
Assessment Reference	AD - Gas Combi + PV	**Prop Type Ref**	
Property	Flat 6, 1 Hampshire Street, London, NW5 2TE		

SAP Rating	88 B	**DER**	14.54	**TER**	21.04
Environmental	89 B	**% DER<TER**	30.89		
CO_2 Emissions (t/year)	0.93	**DFEE**	50.96	**TFEE**	63.48
General Requirements Compliance	Pass	**% DFEE<TFEE**	19.71		

Assessor Details	Mr. Andrew Gwynne, Andrew Gwynne, Tel: 01636 653055, andrew.gwynne@mesenergyservices.co.uk	**Assessor ID**	P741-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	21.04	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	14.54	$kgCO_2/m^2$	Pass
	-6.50 (-30.9%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	63.48	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	50.96	$kWh/m^2/yr$	
	-12.5 (-19.7%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.07 (max. 0.25)	0.07 (max. 0.70)	Pass
Openings	1.34 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.116

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Boiler system with radiators or underfloor - Mains gas Data from manufacturer tbc tbc Combi boiler Efficiency: 89.0% SEDBUK2009 Minimum: 88.0%	Pass

Secondary heating system	None		
5 Cylinder insulation			
Hot water storage	No cylinder		
6 Controls			
Space heating controls	Time and temperature zone control		Pass
Hot water controls	No cylinder		
Boiler interlock	Yes		Pass
7 Low energy lights			
Percentage of fixed lights with low-energy fittings	100	%	
Minimum	75	%	Pass
8 Mechanical ventilation			
Not applicable			

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)	Not significant	Pass

Based on:

Overshading	Average
Windows facing North	1.92 m², No overhang
Windows facing West	2.40 m², No overhang
Air change rate	6.00 ach
Blinds/curtains	None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Solid Wall	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)		
Maximum	10.0		Pass

10 Key features

Party wall U-value	0.00	W/m²K
Door U-value	1.00	W/m²K
Photovoltaic array	1.00	kW

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BASIC COMPLIANCE REPORT
Calculation Type: New Build (As Designed)

Property Reference	Flat 07 - 1 Hamsphire St.	**Issued on Date**	28/05/2020
Assessment Reference	AD - Gas Combi + PV	**Prop Type Ref**	
Property	Flat 7, 1 Hampshire Street, London, NW5 2TE		

SAP Rating	89 B	**DER**	12.04	**TER**	19.44
Environmental	92 A	**% DER<TER**	38.06		
CO_2 Emissions (t/year)	0.57	**DFEE**	42.28	**TFEE**	48.72
General Requirements Compliance	Pass	**% DFEE<TFEE**	13.23		

Assessor Details	Mr. Andrew Gwynne, Andrew Gwynne, Tel: 01636 653055, andrew.gwynne@mesenergyservices.co.uk	**Assessor ID**	P741-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	19.44	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	12.04	$kgCO_2/m^2$	Pass
	-7.40 (-38.1%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	48.72	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	42.28	$kWh/m^2/yr$	
	-6.4 (-13.1%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	Pass
Openings	1.33 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.118

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Boiler system with radiators or underfloor - Mains gas Data from manufacturer tbc tbc Combi boiler Efficiency: 89.0% SEDBUK2009 Minimum: 88.0%	Pass

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

Secondary heating system	None		
5 Cylinder insulation			
Hot water storage	No cylinder		
6 Controls			
Space heating controls	Time and temperature zone control		Pass
Hot water controls	No cylinder		
Boiler interlock	Yes		Pass
7 Low energy lights			
Percentage of fixed lights with low-energy fittings	100	%	
Minimum	75	%	Pass
8 Mechanical ventilation			
Not applicable			

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)	Slight		Pass
Based on:			
Overshading	Average		
Windows facing North	1.56 m², No overhang		
Windows facing East	2.40 m², No overhang		
Air change rate	6.00 ach		
Blinds/curtains	None		

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Solid Wall	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)		
Maximum	10.0		Pass

10 Key features

Party wall U-value	0.00	W/m²K
Roof U-value	0.11	W/m²K
Door U-value	1.00	W/m²K
Photovoltaic array	1.00	kW

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BASIC COMPLIANCE REPORT
Calculation Type: New Build (As Designed)

Property Reference	Flat 08 - 1 Hampshire St.	**Issued on Date**	28/05/2020
Assessment Reference	AD - Gas Combi + PV	**Prop Type Ref**	
Property	Flat 8, 1 Hampshire Street, London, NW5 2TE		

SAP Rating	89 B	**DER**	11.83	**TER**	19.68
Environmental	92 A	**% DER<TER**	39.88		
CO_2 Emissions (t/year)	0.50	**DFEE**	41.73	**TFEE**	46.93
General Requirements Compliance	Pass	**% DFEE<TFEE**	11.07		

Assessor Details	Mr. Andrew Gwynne, Andrew Gwynne, Tel: 01636 653055, andrew.gwynne@mesenergyservices.co.uk	**Assessor ID**	P741-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	19.68	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	11.83	$kgCO_2/m^2$	Pass
	-7.85 (-39.9%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	46.93	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	41.73	$kWh/m^2/yr$	
	-5.2 (-11.1%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	Pass
Openings	1.34 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.172

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Boiler system with radiators or underfloor - Mains gas Data from manufacturer tbc tbc Combi boiler Efficiency: 89.0% SEDBUK2009 Minimum: 88.0%	Pass

Secondary heating system	None		
5 Cylinder insulation			
Hot water storage	No cylinder		
6 Controls			
Space heating controls	Time and temperature zone control		Pass
Hot water controls	No cylinder		
Boiler interlock	Yes		Pass
7 Low energy lights			
Percentage of fixed lights with low-energy fittings	100	%	
Minimum	75	%	Pass
8 Mechanical ventilation			
Not applicable			

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)	Not significant		Pass
Based on:			
Overshading	Average		
Windows facing North	2.57 m², No overhang		
Air change rate	6.00 ach		
Blinds/curtains	None		

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Solid Wall	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)		
Maximum	10.0		Pass

10 Key features

Party wall U-value	0.00	W/m²K
Roof U-value	0.11	W/m²K
Door U-value	1.00	W/m²K
Photovoltaic array	1.00	kW

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BASIC COMPLIANCE REPORT
Calculation Type: New Build (As Designed)

Property Reference	Flat 09 - 1 Hampshire St.	**Issued on Date**	28/05/2020
Assessment Reference	AD - Gas Combi + PV	**Prop Type Ref**	
Property	Flat 9, 1 Hampshire Street, London, NW5 2TE		

SAP Rating	89 B	**DER**	12.55	**TER**	23.83
Environmental	93 A	**% DER<TER**	47.33		
CO_2 Emissions (t/year)	0.35	**DFEE**	51.34	**TFEE**	55.82
General Requirements Compliance	Pass	**% DFEE<TFEE**	8.03		

Assessor Details	Mr. Andrew Gwynne, Andrew Gwynne, Tel: 01636 653055, andrew.gwynne@mesenergyservices.co.uk	**Assessor ID**	P741-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	23.83	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	12.55	$kgCO_2/m^2$	Pass
	-11.28 (-47.3%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	55.82	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	51.34	$kWh/m^2/yr$	
	-4.5 (-8.1%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	Pass
Openings	1.32 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.135

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Boiler system with radiators or underfloor - Mains gas Data from manufacturer tbc tbc Combi boiler Efficiency: 89.0% SEDBUK2009 Minimum: 88.0%	Pass

Secondary heating system	None		
5 Cylinder insulation			
Hot water storage	No cylinder		
6 Controls			
Space heating controls	Time and temperature zone control		Pass
Hot water controls	No cylinder		
Boiler interlock	Yes		Pass
7 Low energy lights			
Percentage of fixed lights with low-energy fittings	100	%	
Minimum	75	%	Pass
8 Mechanical ventilation			
Not applicable			

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)	Slight		Pass
Based on:			
Overshading	Average		
Windows facing North	2.40 m², No overhang		
Air change rate	6.00 ach		
Blinds/curtains	None		

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Solid Wall	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)		
Maximum	10.0		Pass

10 Key features

Party wall U-value	0.00	W/m²K
Roof U-value	0.11	W/m²K
Door U-value	1.00	W/m²K
Photovoltaic array	1.00	kW

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BASIC COMPLIANCE REPORT
Calculation Type: New Build (As Designed)

Property Reference	Flat 10 - 1 Hampshire St.	**Issued on Date**	28/05/2020
Assessment Reference	AD - Gas Combi + PV	**Prop Type Ref**	
Property	Flat 10, 1 Hampshire Street, London, NW5 2TE		

SAP Rating	89 B	**DER**	11.79	**TER**	22.77
Environmental	94 A	**% DER<TER**	48.21		
CO_2 Emissions (t/year)	0.33	**DFEE**	47.67	**TFEE**	51.33
General Requirements Compliance	Pass	**% DFEE<TFEE**	7.13		

Assessor Details	Mr. Andrew Gwynne, Andrew Gwynne, Tel: 01636 653055, andrew.gwynne@mesenergyservices.co.uk	**Assessor ID**	P741-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	22.77	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	11.79	$kgCO_2/m^2$	Pass
	-10.98 (-48.2%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	51.33	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	47.67	$kWh/m^2/yr$	
	-3.6 (-7.0%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	Pass
Openings	1.32 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.178

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Boiler system with radiators or underfloor - Mains gas Data from manufacturer tbc tbc Combi boiler Efficiency: 89.0% SEDBUK2009 Minimum: 88.0%	Pass

Secondary heating system	None		
5 Cylinder insulation			
Hot water storage	No cylinder		
6 Controls			
Space heating controls	Time and temperature zone control		Pass
Hot water controls	No cylinder		
Boiler interlock	Yes		Pass
7 Low energy lights			
Percentage of fixed lights with low-energy fittings	100	%	
Minimum	75	%	Pass
8 Mechanical ventilation			
Not applicable			

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)	Slight		Pass
Based on:			
Overshading	Average		
Windows facing North	2.40 m², No overhang		
Air change rate	6.00 ach		
Blinds/curtains	None		

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Solid Wall	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)		
Maximum	10.0		Pass

10 Key features

Party wall U-value	0.00	W/m²K
Roof U-value	0.11	W/m²K
Door U-value	1.00	W/m²K
Photovoltaic array	1.00	kW

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BASIC COMPLIANCE REPORT
Calculation Type: New Build (As Designed)

Property Reference	Flat 11 - 1 Hampshire St.	**Issued on Date**	28/05/2020
Assessment Reference	AD - Gas Combi + PV	**Prop Type Ref**	
Property	Flat 11, 1 Hampshire Street, London, NW5 2TE		

SAP Rating	90 B	**DER**	9.76	**TER**	22.16
Environmental	95 A	**% DER<TER**	55.96		
CO_2 Emissions (t/year)	0.26	**DFEE**	42.72	**TFEE**	48.32
General Requirements Compliance	Pass	**% DFEE<TFEE**	11.59		

Assessor Details	Mr. Andrew Gwynne, Andrew Gwynne, Tel: 01636 653055, andrew.gwynne@mesenergyservices.co.uk	**Assessor ID**	P741-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	22.16	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	9.76	$kgCO_2/m^2$	Pass
	-12.40 (-56.0%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	48.32	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	42.72	$kWh/m^2/yr$	
	-5.6 (-11.6%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	Pass
Openings	1.31 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.164

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Boiler system with radiators or underfloor - Mains gas Data from manufacturer tbc tbc Combi boiler Efficiency: 89.0% SEDBUK2009 Minimum: 88.0%	Pass

Secondary heating system	None		
5 Cylinder insulation			
Hot water storage	No cylinder		
6 Controls			
Space heating controls	Time and temperature zone control		Pass
Hot water controls	No cylinder		
Boiler interlock	Yes		Pass
7 Low energy lights			
Percentage of fixed lights with low-energy fittings	100	%	
Minimum	75	%	Pass
8 Mechanical ventilation			
Not applicable			

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)	Slight		Pass
Based on:			
Overshading	Average		
Windows facing North	2.57 m², No overhang		
Air change rate	6.00 ach		
Blinds/curtains	None		

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Solid Wall	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)		
Maximum	10.0		Pass

10 Key features

Party wall U-value	0.00	W/m²K
Roof U-value	0.11	W/m²K
Door U-value	1.00	W/m²K
Photovoltaic array	1.00	kW

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BASIC COMPLIANCE REPORT
Calculation Type: New Build (As Designed)

mes buildingsolutions
Part of the FOCUS consultancy group

Property Reference	Flat 12 - 1 Hampshire St.	**Issued on Date**	28/05/2020
Assessment Reference	AD - Gas Combi + PV	**Prop Type Ref**	
Property	Flat 12, 1 Hampshire Street, London, NW5 2TE		

SAP Rating	89 B	**DER**	12.43	**TER**	18.07
Environmental	91 B	**% DER<TER**	31.23		
CO_2 Emissions (t/year)	0.77	**DFEE**	42.01	**TFEE**	47.92
General Requirements Compliance	Pass	**% DFEE<TFEE**	12.33		

Assessor Details	Mr. Andrew Gwynne, Andrew Gwynne, Tel: 01636 653055, andrew.gwynne@mesenergyservices.co.uk	**Assessor ID**	P741-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	18.07	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	12.43	$kgCO_2/m^2$	Pass
	-5.64 (-31.2%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	47.92	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	42.01	$kWh/m^2/yr$	
	-5.9 (-12.3%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	Pass
Openings	1.34 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.118

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Boiler system with radiators or underfloor - Mains gas Data from manufacturer tbc tbc Combi boiler Efficiency: 89.0% SEDBUK2009 Minimum: 88.0%	Pass

Secondary heating system	None		
5 Cylinder insulation			
Hot water storage	No cylinder		
6 Controls			
Space heating controls	Time and temperature zone control		Pass
Hot water controls	No cylinder		
Boiler interlock	Yes		Pass
7 Low energy lights			
Percentage of fixed lights with low-energy fittings	100	%	
Minimum	75	%	Pass
8 Mechanical ventilation			
Not applicable			

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)	Not significant		Pass

Based on:

Overshading	Average		
Windows facing North Windows facing West	1.92 m², No overhang 2.40 m², No overhang		
Air change rate	6.00 ach		
Blinds/curtains	None		

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Solid Wall	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)		
Maximum	10.0		Pass

10 Key features

Party wall U-value	0.00	W/m²K
Roof U-value	0.11	W/m²K
Door U-value	1.00	W/m²K
Photovoltaic array	1.00	kW

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BASIC COMPLIANCE REPORT
Calculation Type: New Build (As Designed)

mes buildingsolutions
Part of the FOCUS consultancy group

Property Reference	Flat 13 - 1 Hampshire St.	**Issued on Date**	28/05/2020
Assessment Reference	AD - Gas Combi + PV	**Prop Type Ref**	
Property	Flat 13, 1 Hampshire Street, London, NW5 2TE		

SAP Rating	88 B	**DER**	13.61	**TER**	20.14
Environmental	90 B	**% DER<TER**	32.42		
CO_2 Emissions (t/year)	0.84	**DFEE**	47.88	**TFEE**	57.91
General Requirements Compliance	Pass	**% DFEE<TFEE**	17.32		

Assessor Details	Mr. Andrew Gwynne, Andrew Gwynne, Tel: 01636 653055, andrew.gwynne@mesenergyservices.co.uk	**Assessor ID**	P741-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	20.14	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	13.61	$kgCO_2/m^2$	Pass
	-6.53 (-32.4%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	57.91	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	47.88	$kWh/m^2/yr$	
	-10.0 (-17.3%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	Pass
Openings	1.35 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.060

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Boiler system with radiators or underfloor - Mains gas Data from manufacturer tbc tbc Combi boiler Efficiency: 89.0% SEDBUK2009 Minimum: 88.0%	Pass

Secondary heating system	None		
5 Cylinder insulation			
Hot water storage	No cylinder		
6 Controls			
Space heating controls	Time and temperature zone control		Pass
Hot water controls	No cylinder		
Boiler interlock	Yes		Pass
7 Low energy lights			
Percentage of fixed lights with low-energy fittings	100	%	
Minimum	75	%	Pass
8 Mechanical ventilation			
Not applicable			

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature			
Overheating risk (Thames Valley)	Not significant		Pass
Based on:			
Overshading	Average		
Windows facing North	2.38 m², No overhang		
Windows facing East	2.38 m², No overhang		
Air change rate	6.00 ach		
Blinds/curtains	None		

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Solid Wall	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability			
Air permeability at 50 pascals	5.00 (design value)		
Maximum	10.0		Pass
10 Key features			
Party wall U-value	0.00	W/m²K	
Roof U-value	0.11	W/m²K	
Door U-value	1.00	W/m²K	
Photovoltaic array	1.00	kW	

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BASIC COMPLIANCE REPORT
Calculation Type: New Build (As Designed)

mes buildingsolutions
Part of the FOCUS consultancy group

Property Reference	Flat 14 - 1 Hampshire St.	**Issued on Date**	28/05/2020
Assessment Reference	AD - Gas Combi + PV	**Prop Type Ref**	
Property	Flat 14, 1 Hampshire Street, London, NW5 2TE		

SAP Rating	89 B	**DER**	12.49	**TER**	20.23
Environmental	92 A	**% DER<TER**	38.26		
CO_2 Emissions (t/year)	0.60	**DFEE**	44.01	**TFEE**	53.99
General Requirements Compliance	Pass	**% DFEE<TFEE**	18.49		

Assessor Details	Mr. Andrew Gwynne, Andrew Gwynne, Tel: 01636 653055, andrew.gwynne@mesenergyservices.co.uk	**Assessor ID**	P741-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	20.23	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	12.49	$kgCO_2/m^2$	Pass
	-7.74 (-38.3%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	53.99	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	44.01	$kWh/m^2/yr$	
	-10.0 (-18.5%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.13 (max. 0.25)	0.13 (max. 0.70)	Pass
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	Pass
Openings	1.34 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.055

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Boiler system with radiators or underfloor - Mains gas Data from manufacturer tbc tbc Combi boiler Efficiency: 89.0% SEDBUK2009 Minimum: 88.0%		Pass
Secondary heating system	None		

5 Cylinder insulation

Hot water storage	No cylinder		

6 Controls

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

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)	Not significant		Pass

Based on:

Overshading	Average		
Windows facing North	4.76 m², No overhang		
Air change rate	6.00 ach		
Blinds/curtains	None		

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Solid Wall	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)		
Maximum	10.0		Pass

10 Key features

Party wall U-value	0.00	W/m²K
Roof U-value	0.11	W/m²K
Door U-value	1.00	W/m²K
Photovoltaic array	1.00	kW

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BASIC COMPLIANCE REPORT
Calculation Type: New Build (As Designed)

mes buildingsolutions
Part of the FOCUS consultancy group

Property Reference	Flat 15 - 1 Hampshire St.	**Issued on Date**	28/05/2020
Assessment Reference	AD - Gas Combi + PV	**Prop Type Ref**	
Property	Flat 15, 1 Hampshire Street, London, NW5 2TE		

SAP Rating	88 B	**DER**	14.04	**TER**	19.73
Environmental	90 B	**% DER<TER**	28.83		
CO_2 Emissions (t/year)	0.85	**DFEE**	48.99	**TFEE**	56.05
General Requirements Compliance	Pass	**% DFEE<TFEE**	12.59		

Assessor Details	Mr. Andrew Gwynne, Andrew Gwynne, Tel: 01636 653055, andrew.gwynne@mesenergyservices.co.uk	**Assessor ID**	P741-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	19.73	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	14.04	$kgCO_2/m^2$	Pass
	-5.69 (-28.8%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	56.05	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	48.99	$kWh/m^2/yr$	
	-7.0 (-12.5%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.13 (max. 0.25)	0.13 (max. 0.70)	Pass
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	Pass
Openings	1.35 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.080

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Boiler system with radiators or underfloor - Mains gas Data from manufacturer tbc tbc Combi boiler Efficiency: 89.0% SEDBUK2009 Minimum: 88.0%		Pass
Secondary heating system	None		

5 Cylinder insulation

Hot water storage	No cylinder		

6 Controls

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

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)	Not significant		Pass

Based on:

Overshading	Average		
Windows facing North	4.93 m², No overhang		
Air change rate	6.00 ach		
Blinds/curtains	None		

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Solid Wall	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)		
Maximum	10.0		Pass

10 Key features

Party wall U-value	0.00	W/m²K
Roof U-value	0.11	W/m²K
Door U-value	1.00	W/m²K
Photovoltaic array	1.00	kW

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BASIC COMPLIANCE REPORT
Calculation Type: New Build (As Designed)

Property Reference	Flat 16 - 1 Hampshire St.	**Issued on Date**	28/05/2020
Assessment Reference	AD - Gas Combi + PV	**Prop Type Ref**	
Property	Flat 16, 1 Hampshire Street, London, NW5 2TE		

SAP Rating	88 B	**DER**	13.23	**TER**	19.31
Environmental	90 B	**% DER<TER**	31.50		
CO_2 Emissions (t/year)	0.85	**DFEE**	45.43	**TFEE**	54.97
General Requirements Compliance	Pass	**% DFEE<TFEE**	17.34		

Assessor Details	Mr. Andrew Gwynne, Andrew Gwynne, Tel: 01636 653055, andrew.gwynne@mesenergyservices.co.uk	**Assessor ID**	P741-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	19.31	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	13.23	$kgCO_2/m^2$	Pass
	-6.08 (-31.5%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	54.97	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	45.43	$kWh/m^2/yr$	
	-9.6 (-17.5%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	Pass
Openings	1.34 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.058

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Boiler system with radiators or underfloor - Mains gas Data from manufacturer tbc tbc Combi boiler Efficiency: 89.0% SEDBUK2009 Minimum: 88.0%	Pass

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

Secondary heating system	None		
5 Cylinder insulation			
Hot water storage	No cylinder		
6 Controls			
Space heating controls	Time and temperature zone control		Pass
Hot water controls	No cylinder		
Boiler interlock	Yes		Pass
7 Low energy lights			
Percentage of fixed lights with low-energy fittings	100	%	
Minimum	75	%	Pass
8 Mechanical ventilation			
Not applicable			

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature			
Overheating risk (Thames Valley)	Not significant		Pass
Based on:			
Overshading	Average		
Windows facing North	2.55 m², No overhang		
Windows facing West	2.38 m², No overhang		
Air change rate	6.00 ach		
Blinds/curtains	None		

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Solid Wall	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability			
Air permeability at 50 pascals	5.00 (design value)		
Maximum	10.0		Pass
10 Key features			
Party wall U-value	0.00	W/m²K	
Roof U-value	0.11	W/m²K	
Door U-value	1.00	W/m²K	
Photovoltaic array	1.00	kW	

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

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

Property Reference	Flat 01 - 1 Hampshire St.	**Issued on Date**	11/05/2020
Assessment Reference	AD - Gas Combi + PV	**Prop Type Ref**	
Property	Flat 1, 1 Hampshire Street, London, NW5 2TE		

SAP Rating	82 B	**DER**	14.41	**TER**	22.30
Environmental	90 B	**% DER<TER**	35.39		
CO_2 Emissions (t/year)	0.70	**DFEE**	52.27	**TFEE**	63.71
General Requirements Compliance	Pass	**% DFEE<TFEE**	17.95		

Assessor Details	Mr. Andrew Gwynne, Andrew Gwynne, Tel: 01636 653055, andrew.gwynne@mesenergyservices.co.uk	**Assessor ID**	P741-0001
Client			

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

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

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

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DWELLING AS DESIGNED

Mid-floor flat, total floor area 66 m²

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

1a TER and DER
Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 22.30 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.41 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)63.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)52.3 kWh/m²/yrOK

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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	0.07 (max. 0.25)	0.07 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.33 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated using user-specified y-value of 0.126

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3 Air permeability
Air permeability at 50 pascals: 5.00 (design value)
Maximum 10.0 OK

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4 Heating efficiency
Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
tbc tbc
Combi boiler
Efficiency: 89.0% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

---

5 Cylinder insulation
Hot water storage No cylinder

---

6 Controls
Space heating controls: Time and temperature zone control OK

Hot water controls: No cylinder

Boiler interlock Yes OK

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

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8 Mechanical ventilation
Not applicable

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9 Summertime temperature
Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing North: 1.56 m², No overhang
Windows facing East: 2.40 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

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10 Key features
Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Photovoltaic array 1.00 kW

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	66.2700 (1b)	x	2.4000 (2b)	=	159.0480	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.2700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	159.0480	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1257	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3757	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3194	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4072	0.3992	0.3912	0.3513	0.3433	0.3034	0.3034	0.2954	0.3194	0.3433	0.3593	0.3753	(22b)
Effective ac	0.5829	0.5797	0.5765	0.5617	0.5589	0.5460	0.5460	0.5436	0.5510	0.5589	0.5646	0.5704	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 1.40)			3.9600	1.3258	5.2500			(27)
Ext Door			2.3300	1.0000	2.3300			(26)
Glazed Door			7.2000	1.4000	10.0800			(26a)
Floor Onto Commercial			66.2700	0.0650	4.3076			(28b)
External Wall 1	73.7800	13.4900	60.2900	0.1800	10.8522	0.0000	0.0000	(29a)
Total net area of external elements Aum(A, m2)			140.0500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.8198			(33)
Party Wall 1			30.6300	0.0000	0.0000	0.0000	0.0000	(32)
Party Ceilings 1			66.2700			0.0000	0.0000	(32b)
Stud Wall			108.6700			75.0000	8150.2500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		8150.2500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							122.9855	(35)
Thermal bridges (User defined value 0.126 * total exposed area)							17.6463	(36)
Total fabric heat loss					(33) + (36) =		50.4661	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	30.5947	30.4257	30.2601	29.4821	29.3365	28.6589	28.6589	28.5334	28.9199	29.3365	29.6310	29.9388	(38)
Heat transfer coeff	81.0607	80.8917	80.7261	79.9481	79.8025	79.1249	79.1249	78.9995	79.3859	79.8025	80.0970	80.4049	(39)
Average = Sum(39)m / 12 =												79.9474	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2232	1.2206	1.2181	1.2064	1.2042	1.1940	1.1940	1.1921	1.1979	1.2042	1.2086	1.2133	(40)
HLP (average)												1.2064	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.1523 (42)
Average daily hot water use (litres/day)		85.3167 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	93.8484	90.4357	87.0230	83.6104	80.1977	76.7850	76.7850	80.1977	83.6104	87.0230	90.4357	93.8484	(44)
Energy conte	139.1744	121.7228	125.6071	109.5073	105.0748	90.6716	84.0206	96.4148	97.5663	113.7041	124.1170	134.7830	(45)
Energy content (annual)										Total = Sum(45)m =		1342.3638	(45)
Distribution loss (46)m = 0.15 x (45)m	20.8762	18.2584	18.8411	16.4261	15.7612	13.6007	12.6031	14.4622	14.6349	17.0556	18.6175	20.2174	(46)

Water storage loss:

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Total storage loss
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (56)
If cylinder contains dedicated solar storage
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (57)
Combi loss 47.8241 41.6252 44.3460 41.2325 40.8679 37.8666 39.1288 40.8679 41.2325 44.3460 44.5984 47.8241 (61)
Total heat required for water heating calculated for each month
186.9985 163.3480 169.9530 150.7398 145.9427 128.5382 123.1494 137.2827 138.7988 158.0501 168.7154 182.6071 (62)
WWHRS -29.1000 -25.6015 -26.1312 -21.5187 -19.9902 -16.4978 -13.9750 -16.9164 -17.4043 -21.5017 -24.8884 -28.1223 eq.(G10)
Total of WWHRS savings -261.6476
Solar input 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)
Output from w/h
157.8985 137.7465 143.8218 129.2211 125.9525 112.0404 109.1743 120.3663 121.3946 136.5484 143.8269 154.4848 (64)
Total per year (kWh/year) = Sum(64)m = 1592.4762 (64)
Heat gains from water heating, kWh/month
58.2315 50.8791 52.8508 46.7193 45.1544 39.6150 37.7190 42.2749 42.7489 48.8931 52.4185 56.7714 (65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	107.6141	107.6141	107.6141	107.6141	107.6141	107.6141	107.6141	107.6141	107.6141	107.6141	107.6141	107.6141	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
21.2995 18.9180 15.3852 11.6476 8.7067 7.3506 7.9425 10.3240 13.8569 17.5945 20.5354 21.8915 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
188.4399 190.3954 185.4678 174.9775 161.7355 149.2898 140.9753 139.0199 143.9475 154.4377 167.6798 180.1255 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
33.7614 33.7614 33.7614 33.7614 33.7614 33.7614 33.7614 33.7614 33.7614 33.7614 33.7614 33.7614 (69)
Pumps, fans 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-86.0913 -86.0913 -86.0913 -86.0913 -86.0913 -86.0913 -86.0913 -86.0913 -86.0913 -86.0913 -86.0913 -86.0913 (71)
Water heating gains (Table 5)
78.2682 75.7130 71.0361 64.8879 60.6913 55.0208 50.6976 56.8211 59.3735 65.7166 72.8035 76.3056 (72)
Total internal gains
346.2919 343.3106 330.1733 309.7972 289.4177 269.9454 257.8997 264.4493 275.4621 296.0330 319.3029 336.6068 (73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.5600	10.6334	0.7600	0.7000	0.7700	6.1156	(74)
East	2.4000	19.6403	0.7600	0.7000	0.7700	17.3781	(76)

Solar gains 23.4938 45.6826 75.8450 113.5510 143.0386 148.4387 140.4727 117.8459 88.9910 54.2505 29.2129 19.3892 (83)
Total gains 369.7856 388.9933 406.0183 423.3483 432.4563 418.3841 398.3724 382.2952 364.4532 350.2835 348.5158 355.9960 (84)

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7. Mean internal temperature (heating season)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.9292	27.9875	28.0449	28.3178	28.3695	28.6125	28.6125	28.6579	28.5184	28.3695	28.2652	28.1570	
alpha	2.8619	2.8658	2.8697	2.8879	2.8913	2.9075	2.9075	2.9105	2.9012	2.8913	2.8843	2.8771	

util living area
0.9822 0.9778 0.9682 0.9461 0.9003 0.8102 0.6920 0.7251 0.8711 0.9506 0.9756 0.9840 (86)

MIT	19.1850	19.3029	19.5534	19.9170	20.2904	20.6141	20.7805	20.7565	20.5041	20.0386	19.5572	19.1630	(87)
Th 2	19.9015	19.9035	19.9055	19.9149	19.9166	19.9248	19.9248	19.9263	19.9217	19.9166	19.9131	19.9094	(88)

util rest of house
0.9789 0.9736 0.9616 0.9335 0.8726 0.7467 0.5767 0.6179 0.8243 0.9366 0.9702 0.9811 (89)

MIT 2	17.4666	17.6397	18.0053	18.5370	19.0680	19.5097	19.7038	19.6822	19.3712	18.7172	18.0177	17.4399	(90)

Living area fraction fLA = Living area / (4) = 0.3831 (91)

MIT	18.1250	18.2769	18.5984	19.0657	19.5364	19.9329	20.1164	20.0938	19.8053	19.2235	18.6075	18.1001	(92)

Temperature adjustment -0.1500

adjusted MIT	17.9750	18.1269	18.4484	18.9157	19.3864	19.7829	19.9664	19.9438	19.6553	19.0735	18.4575	17.9501	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9708	0.9643	0.9499	0.9183	0.8556	0.7366	0.5819	0.6199	0.8097	0.9220	0.9603	0.9737	(94)
Useful gains	358.9848	375.0883	385.6737	388.7760	369.9910	308.1769	231.8095	236.9867	295.1089	322.9630	334.6747	346.6180	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)

Heat loss rate W
1108.5016 1069.9487 964.5485 800.7376 613.3923 410.0933 266.3623 279.9568 441.0106 676.2043 909.7037 1105.5745 (97)

Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)

Space heating kWh
557.6405 466.9462 430.6828 296.6123 181.0905 0.0000 0.0000 0.0000 0.0000 262.8115 414.0208 564.6637 (98)
Space heating 3174.4685 (98)
Space heating per m2 (98) / (4) = 47.9020 (99)

8c. Space cooling requirement

Not applicable

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	89.9000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	3531.1106	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	557.6405	466.9462	430.6828	296.6123	181.0905	0.0000	0.0000	0.0000	0.0000	262.8115	414.0208	564.6637	(98)
Space heating efficiency (main heating system 1)													
	89.9000	89.9000	89.9000	89.9000	89.9000	0.0000	0.0000	0.0000	0.0000	89.9000	89.9000	89.9000	(210)
Space heating fuel (main heating system)													
	620.2898	519.4062	479.0688	329.9359	201.4355	0.0000	0.0000	0.0000	0.0000	292.3376	460.5349	628.1020	(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													
	157.8985	137.7465	143.8218	129.2211	125.9525	112.0404	109.1743	120.3663	121.3946	136.5484	143.8269	154.4848	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.4574	87.3807	87.1390	86.5749	85.4629	79.8000	79.8000	79.8000	79.8000	86.1709	87.0591	87.5204	(217)
Fuel for water heating, kWh/month													
	180.5434	157.6395	165.0487	149.2593	147.3768	140.4015	136.8100	150.8350	152.1235	158.4623	165.2061	176.5128	(219)
Water heating fuel used												1880.2189	(219)
Annual totals kWh/year													
Space heating fuel - main system												3531.1106	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												376.1562	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.00 * 1080 * 1.00) =												-863.6197	(233)
Total delivered energy for all uses												4998.8660	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3531.1106	0.2160	762.7199	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1880.2189	0.2160	406.1273	(264)
Space and water heating			1168.8472	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	376.1562	0.5190	195.2251	(268)
Energy saving/generation technologies				
PV Unit	-863.6197	0.5190	-448.2186	(269)
Total CO2, kg/year			954.7786	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.4100	(273)

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

DER		14.4100	ZC1
Total Floor Area	TFA	66.2700	
Assumed number of occupants	N	2.1523	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.8501	ZC2
CO2 emissions from cooking, equation (L16)		2.5751	ZC3
Total CO2 emissions		33.8352	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		33.8352	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	66.2700 (1b)	x	2.4000 (2b)	=	159.0480	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.2700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	159.0480	(5)

2. Ventilation rate

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000	/ (5) =	0.1257	(8)
Pressure test			Yes	
Measured/design AP50			5.0000	
Infiltration rate			0.3757	(18)
Number of sides sheltered			2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.3194	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4072	0.3992	0.3912	0.3513	0.3433	0.3034	0.3034	0.2954	0.3194	0.3433	0.3593	0.3753	(22b)
Effective ac	0.5829	0.5797	0.5765	0.5617	0.5589	0.5460	0.5460	0.5436	0.5510	0.5589	0.5646	0.5704	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.3300	1.0000	2.3300			(26)
TER Semi-glazed door			7.2000	1.2000	8.6400			(26a)
TER Opening Type (Uw = 1.40)			3.9600	1.3258	5.2500			(27)
Floor Onto Commercial			66.2700	0.1300	8.6151			(28b)
External Wall 1	73.7800	13.4900	60.2900	0.1800	10.8522			(29a)
Total net area of external elements Aum(A, m2)			140.0500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.6873			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.9219	(36)
Total fabric heat loss					(33) + (36) =		49.6092	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	30.5947	30.4257	30.2601	29.4821	29.3365	28.6589	28.6589	28.5334	28.9199	29.3365	29.6310	29.9388	(38)
Heat transfer coeff	80.2039	80.0349	79.8693	79.0913	78.9457	78.2681	78.2681	78.1426	78.5291	78.9457	79.2402	79.5480	(39)
Average = Sum(39)m / 12 =												79.0906	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2103	1.2077	1.2052	1.1935	1.1913	1.1810	1.1810	1.1792	1.1850	1.1913	1.1957	1.2004	(40)
HLP (average)												1.1935	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1523	(42)
Average daily hot water use (litres/day)												85.3167	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	93.8484	90.4357	87.0230	83.6104	80.1977	76.7850	76.7850	80.1977	83.6104	87.0230	90.4357	93.8484	(44)
Energy conte	139.1744	121.7228	125.6071	109.5073	105.0748	90.6716	84.0206	96.4148	97.5663	113.7041	124.1170	134.7830	(45)
Energy content (annual)										Total = Sum(45)m =		1342.3638	(45)
Distribution loss (46)m = 0.15 x (45)m	20.8762	18.2584	18.8411	16.4261	15.7612	13.6007	12.6031	14.4622	14.6349	17.0556	18.6175	20.2174	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	47.8241	41.6252	44.3460	41.2325	40.8679	37.8666	39.1288	40.8679	41.2325	44.3460	44.5984	47.8241	(61)
Total heat required for water heating calculated for each month													
	186.9985	163.3480	169.9530	150.7398	145.9427	128.5382	123.1494	137.2827	138.7988	158.0501	168.7154	182.6071	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h													
	186.9985	163.3480	169.9530	150.7398	145.9427	128.5382	123.1494	137.2827	138.7988	158.0501	168.7154	182.6071	(64)
									Total per year (kWh/year) = Sum(64)m =			1854.1238	(64)
Heat gains from water heating, kWh/month													
	58.2315	50.8791	52.8508	46.7193	45.1544	39.6150	37.7190	42.2749	42.7489	48.8931	52.4185	56.7714	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	107.6141	107.6141	107.6141	107.6141	107.6141	107.6141	107.6141	107.6141	107.6141	107.6141	107.6141	107.6141	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	21.2995	18.9180	15.3852	11.6476	8.7067	7.3506	7.9425	10.3240	13.8569	17.5945	20.5354	21.8915	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	188.4399	190.3954	185.4678	174.9775	161.7355	149.2898	140.9753	139.0199	143.9475	154.4377	167.6798	180.1255	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.7614	33.7614	33.7614	33.7614	33.7614	33.7614	33.7614	33.7614	33.7614	33.7614	33.7614	33.7614	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-86.0913	-86.0913	-86.0913	-86.0913	-86.0913	-86.0913	-86.0913	-86.0913	-86.0913	-86.0913	-86.0913	-86.0913	(71)
Water heating gains (Table 5)													
	78.2682	75.7130	71.0361	64.8879	60.6913	55.0208	50.6976	56.8211	59.3735	65.7166	72.8035	76.3056	(72)
Total internal gains													
	346.2919	343.3106	330.1733	309.7972	289.4177	269.9454	257.8997	264.4493	275.4621	296.0330	319.3029	336.6068	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.5600	10.6334	0.6300	0.7000	0.7700	5.0695	(74)
East	2.4000	19.6403	0.6300	0.7000	0.7700	14.4056	(76)

Solar gains	19.4751	37.8685	62.8715	94.1278	118.5714	123.0479	116.4444	97.6881	73.7689	44.9708	24.2160	16.0727	(83)
Total gains	365.7670	381.1791	393.0448	403.9251	407.9892	392.9932	374.3442	362.1373	349.2310	341.0039	343.5188	352.6795	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	57.3798	57.5010	57.6202	58.1870	58.2943	58.7990	58.7990	58.8934	58.6035	58.2943	58.0777	57.8529	
alpha	4.8253	4.8334	4.8413	4.8791	4.8863	4.9199	4.9199	4.9262	4.9069	4.8863	4.8718	4.8569	
util living area													
	0.9986	0.9980	0.9965	0.9914	0.9740	0.9143	0.7946	0.8282	0.9555	0.9920	0.9976	0.9989	(86)
MIT	19.6345	19.7264	19.9246	20.2174	20.5262	20.8005	20.9339	20.9161	20.7069	20.3209	19.9336	19.6180	(87)
Th 2	19.9118	19.9138	19.9158	19.9252	19.9270	19.9352	19.9352	19.9367	19.9320	19.9270	19.9234	19.9197	(88)
util rest of house													
	0.9981	0.9973	0.9951	0.9873	0.9590	0.8553	0.6567	0.7034	0.9214	0.9874	0.9966	0.9985	(89)
MIT 2	18.0906	18.2265	18.5176	18.9507	19.3950	19.7670	19.9038	19.8920	19.6511	19.1037	18.5365	18.0720	(90)
Living area fraction									fLA = Living area / (4) =			0.3831	(91)
MIT	18.6821	18.8012	19.0567	19.4360	19.8284	20.1630	20.2985	20.2844	20.0556	19.5701	19.0718	18.6643	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6821	18.8012	19.0567	19.4360	19.8284	20.1630	20.2985	20.2844	20.0556	19.5701	19.0718	18.6643	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9973	0.9963	0.9934	0.9847	0.9572	0.8707	0.7100	0.7505	0.9265	0.9852	0.9955	0.9978	(94)
Useful gains	364.7871	379.7624	390.4701	397.7588	390.5213	342.1619	265.7768	271.7994	323.5559	335.9611	341.9608	351.8949	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1153.4996	1112.5776	1002.8918	833.3091	641.7034	435.4041	289.4712	303.5336	467.6864	708.1472	948.6443	1150.6089	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	586.8021	492.4518	455.6417	313.5962	186.8795	0.0000	0.0000	0.0000	0.0000	276.9064	436.8121	594.2432	(98)
Space heating												3343.3331	(98)
Space heating per m2											(98) / (4) =	50.4502	(99)

8c. Space cooling requirement

Not applicable

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

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.4000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												3579.5857	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	586.8021	492.4518	455.6417	313.5962	186.8795	0.0000	0.0000	0.0000	0.0000	276.9064	436.8121	594.2432	(98)
Space heating efficiency (main heating system 1)													
	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)													
	628.2678	527.2503	487.8391	335.7561	200.0851	0.0000	0.0000	0.0000	0.0000	296.4737	467.6789	636.2347	(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													
	186.9985	163.3480	169.9530	150.7398	145.9427	128.5382	123.1494	137.2827	138.7988	158.0501	168.7154	182.6071	(64)
Efficiency of water heater												80.3000	(216)
(217)m	87.7333	87.6539	87.4131	86.8536	85.6747	80.3000	80.3000	80.3000	80.3000	86.4489	87.3392	87.8040	(217)
Fuel for water heating, kWh/month													
	213.1444	186.3557	194.4251	173.5562	170.3451	160.0725	153.3616	170.9623	172.8504	182.8248	193.1726	207.9712	(219)
Water heating fuel used												2179.0419	(219)
Annual totals kWh/year													
Space heating fuel - main system												3579.5857	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												376.1562	(232)
Total delivered energy for all uses												6209.7838	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3579.5857	0.2160	773.1905	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2179.0419	0.2160	470.6730	(264)
Space and water heating			1243.8636	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	376.1562	0.5190	195.2251	(268)
Total CO2, kg/m2/year			1478.0136	(272)
Emissions per m2 for space and water heating			18.7696	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.9459	(272b)
Emissions per m2 for pumps and fans			0.5874	(272c)
Target Carbon Dioxide Emission Rate (TER) = (18.7696 * 1.00) + 2.9459 + 0.5874, rounded to 2 d.p.			22.3000	(273)

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

Property Reference	Flat 02 - 1 Hampshire St.	**Issued on Date**	11/05/2020
Assessment Reference	AD - Gas Combi + PV	**Prop Type Ref**	
Property	Flat 2, 1 Hampshire Street, London, NW5 2TE		

SAP Rating	88 B	**DER**	13.61	**TER**	22.11
Environmental	91 B	**% DER<TER**	38.45		
CO_2 Emissions (t/year)	0.59	**DFEE**	49.30	**TFEE**	59.71
General Requirements Compliance	Pass	**% DFEE<TFEE**	17.43		

Assessor Details	Mr. Andrew Gwynne, Andrew Gwynne, Tel: 01636 653055, andrew.gwynne@mesenergyservices.co.uk	**Assessor ID**	P741-0001
Client			

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

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

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

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DWELLING AS DESIGNED

Mid-floor flat, total floor area 61 m²

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

1a TER and DER
Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 22.11 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.61 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)59.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)49.3 kWh/m²/yrOK

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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	0.07 (max. 0.25)	0.07 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.34 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated using user-specified y-value of 0.129

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3 Air permeability
Air permeability at 50 pascals: 5.00 (design value)
Maximum 10.0 OK

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4 Heating efficiency
Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
tbc tbc
Combi boiler
Efficiency: 89.0% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

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5 Cylinder insulation
Hot water storage No cylinder

---

6 Controls
Space heating controls: Time and temperature zone control OK

Hot water controls: No cylinder

Boiler interlock Yes OK

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

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8 Mechanical ventilation
Not applicable

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9 Summertime temperature
Overheating risk (Thames Valley): Not significant OK
Based on:
Overshading: Average
Windows facing North: 2.57 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

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10 Key features
Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Photovoltaic array 1.00 kW

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	60.6300 (1b)	x	2.4000 (2b)	=	145.5120	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.6300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	145.5120	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1374	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3874	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3293	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4199	0.4117	0.4034	0.3623	0.3540	0.3129	0.3129	0.3046	0.3293	0.3540	0.3705	0.3870	(22b)
Effective ac	0.5882	0.5847	0.5814	0.5656	0.5627	0.5489	0.5489	0.5464	0.5542	0.5627	0.5686	0.5749	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 1.40)			2.5700	1.3258	3.4072			(27)
Ext Door			2.3300	1.0000	2.3300			(26)
Glazed Door			10.4400	1.4000	14.6160			(26a)
Floor Onto Commercial			60.6300	0.0650	3.9410			(28b)
External Wall 1	38.9300	15.3400	23.5900	0.1800	4.2462	0.0000	0.0000	(29a)
Total net area of external elements Aum(A, m2)			99.5600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.5403			(33)
Party Wall 1			48.5000	0.0000	0.0000	0.0000	0.0000	(32)
Party Ceilings 1			60.6300			0.0000	0.0000	(32b)
Stud Wall			97.6300			75.0000	7322.2500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		7322.2500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							120.7694	(35)
Thermal bridges (User defined value 0.129 * total exposed area)							12.8432	(36)
Total fabric heat loss					(33) + (36) =		41.3836	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.2426	28.0782	27.9171	27.1603	27.0187	26.3596	26.3596	26.2375	26.6135	27.0187	27.3052	27.6046	(38)
Heat transfer coeff	69.6262	69.4618	69.3007	68.5439	68.4023	67.7432	67.7432	67.6211	67.9971	68.4023	68.6888	68.9882	(39)
Average = Sum(39)m / 12 =												68.5432	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1484	1.1457	1.1430	1.1305	1.1282	1.1173	1.1173	1.1153	1.1215	1.1282	1.1329	1.1379	(40)
HLP (average)												1.1305	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.9994 (42)
Average daily hot water use (litres/day)		81.6855 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	89.8541	86.5866	83.3192	80.0518	76.7844	73.5170	73.5170	76.7844	80.0518	83.3192	86.5866	89.8541	(44)
Energy conte	133.2510	116.5422	120.2611	104.8465	100.6027	86.8125	80.4445	92.3113	93.4138	108.8648	118.8344	129.0465	(45)
Energy content (annual)										Total = Sum(45)m =		1285.2312	(45)
Distribution loss (46)m = 0.15 x (45)m	19.9876	17.4813	18.0392	15.7270	15.0904	13.0219	12.0667	13.8467	14.0121	16.3297	17.8252	19.3570	(46)
Water storage loss:													

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	45.7886	39.8536	42.4586	39.4776	39.1285	36.2549	37.4634	39.1285	39.4776	42.4586	42.7003	45.7886	(61)
Total heat required for water heating calculated for each month													
	179.0396	156.3957	162.7196	144.3241	139.7312	123.0674	117.9080	131.4398	132.8914	151.3233	161.5347	174.8351	(62)
WWHRS	-27.3776	-24.0852	-24.5840	-20.2512	-18.8162	-15.5313	-13.1606	-15.9291	-16.3866	-20.2397	-23.4212	-26.4563	eq.(G10)
Total of WWHRS savings												-246.2389	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h													
	151.6621	132.3106	138.1356	124.0729	120.9150	107.5362	104.7473	115.5107	116.5048	131.0836	138.1134	148.3788	(64)
								Total per year (kWh/year) = Sum(64)m =				1528.9711	(64)
Heat gains from water heating, kWh/month													
	55.7531	48.7137	50.6014	44.7309	43.2325	37.9289	36.1137	40.4756	40.9295	46.8122	50.1875	54.3551	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	20.6354	18.3282	14.9055	11.2844	8.4352	7.1214	7.6949	10.0021	13.4248	17.0459	19.8951	21.2089	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	174.5330	176.3441	171.7801	162.0641	149.7993	138.2721	130.5713	128.7602	133.3241	143.0402	155.3049	166.8321	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	(71)
Water heating gains (Table 5)													
	74.9370	72.4906	68.0127	62.1262	58.1082	52.6790	48.5399	54.4027	56.8465	62.9196	69.7049	73.0579	(72)
Total internal gains													
	326.0962	323.1537	310.6892	291.4656	272.3336	254.0634	242.7969	249.1559	259.5863	278.9965	300.8958	317.0899	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.5700	10.6334	0.7600	0.7000	0.7700	10.0751	(74)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	10.0751	19.2541	32.7173	52.5524	70.7929	75.7859	70.7559	56.1358	39.3368	22.9194	12.4289	8.3991	(83)
Total gains	336.1713	342.4078	343.4065	344.0180	343.1266	329.8493	313.5528	305.2916	298.9231	301.9159	313.3247	325.4890	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.2125	29.2817	29.3497	29.6738	29.7352	30.0245	30.0245	30.0787	29.9124	29.7352	29.6112	29.4827	
alpha	2.9475	2.9521	2.9566	2.9783	2.9823	3.0016	3.0016	3.0052	2.9942	2.9823	2.9741	2.9655	
util living area													
	0.9815	0.9787	0.9721	0.9561	0.9201	0.8417	0.7308	0.7573	0.8873	0.9538	0.9753	0.9832	(86)
MIT	19.2719	19.3682	19.5879	19.9206	20.2760	20.6009	20.7736	20.7519	20.5059	20.0724	19.6274	19.2549	(87)
Th 2	19.9615	19.9637	19.9659	19.9760	19.9779	19.9867	19.9867	19.9884	19.9833	19.9779	19.9740	19.9700	(88)
util rest of house													
	0.9782	0.9748	0.9665	0.9459	0.8976	0.7866	0.6240	0.6588	0.8464	0.9411	0.9700	0.9803	(89)
MIT 2	17.6354	17.7772	18.0987	18.5880	19.0977	19.5489	19.7573	19.7365	19.4249	18.8107	18.1628	17.6165	(90)
Living area fraction									fLA = Living area / (4) =			0.3663	(91)
MIT	18.2349	18.3600	18.6442	19.0762	19.5294	19.9343	20.1296	20.1084	19.8209	19.2728	18.6993	18.2167	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.0849	18.2100	18.4942	18.9262	19.3794	19.7843	19.9796	19.9584	19.6709	19.1228	18.5493	18.0667	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9700	0.9658	0.9557	0.9321	0.8807	0.7731	0.6231	0.6553	0.8304	0.9269	0.9600	0.9726	(94)
Useful gains	326.0941	330.6910	328.1790	320.6502	302.2039	255.0108	195.3688	200.0675	248.2133	279.8568	300.7934	316.5864	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	959.7871	924.5381	831.2089	687.2318	525.2859	351.2019	228.9423	240.6263	378.8041	582.9826	786.4390	956.6391	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	471.4676	399.0653	374.2542	263.9387	165.9730	0.0000	0.0000	0.0000	0.0000	225.5256	349.6648	476.1992	(98)
Space heating												2726.0885	(98)
Space heating per m2											(98) / (4) =	44.9627	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	89.9000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	3032.3565	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	471.4676	399.0653	374.2542	263.9387	165.9730	0.0000	0.0000	0.0000	0.0000	225.5256	349.6648	476.1992	(98)
Space heating efficiency (main heating system 1)													
	89.9000	89.9000	89.9000	89.9000	89.9000	0.0000	0.0000	0.0000	0.0000	89.9000	89.9000	89.9000	(210)
Space heating fuel (main heating system)													
	524.4356	443.8991	416.3006	293.5915	184.6195	0.0000	0.0000	0.0000	0.0000	250.8627	388.9486	529.6988	(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													
	151.6621	132.3106	138.1356	124.0729	120.9150	107.5362	104.7473	115.5107	116.5048	131.0836	138.1134	148.3788	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.2134	87.1534	86.9337	86.4031	85.3472	79.8000	79.8000	79.8000	79.8000	85.9035	86.7897	87.2758	(217)
Fuel for water heating, kWh/month													
	173.8976	151.8134	158.8976	143.5977	141.6742	134.7571	131.2623	144.7502	145.9960	152.5941	159.1357	170.0115	(219)
Water heating fuel used												1808.3876	(219)
Annual totals kWh/year													
Space heating fuel - main system												3032.3565	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												364.4281	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.00 * 1080 * 1.00) =										-863.6197		-863.6197	(233)
Total delivered energy for all uses												4416.5524	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3032.3565	0.2160	654.9890	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1808.3876	0.2160	390.6117	(264)
Space and water heating			1045.6007	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	364.4281	0.5190	189.1382	(268)
Energy saving/generation technologies				
PV Unit	-863.6197	0.5190	-448.2186	(269)
Total CO2, kg/year			825.4453	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.6100	(273)

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

DER		13.6100	ZC1
Total Floor Area	TFA	60.6300	
Assumed number of occupants	N	1.9994	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.0583	ZC2
CO2 emissions from cooking, equation (L16)		2.7542	ZC3
Total CO2 emissions		33.4225	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		33.4225	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	60.6300 (1b)	x	2.4000 (2b)	=	145.5120	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.6300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	145.5120	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1374	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3874	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3293	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4199	0.4117	0.4034	0.3623	0.3540	0.3129	0.3129	0.3046	0.3293	0.3540	0.3705	0.3870	(22b)
Effective ac	0.5882	0.5847	0.5814	0.5656	0.5627	0.5489	0.5489	0.5464	0.5542	0.5627	0.5686	0.5749	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.3300	1.0000	2.3300			(26)
TER Semi-glazed door			10.4400	1.2000	12.5280			(26a)
TER Opening Type (Uw = 1.40)			2.3900	1.3258	3.1686			(27)
Floor Onto Commercial			60.6300	0.1300	7.8819			(28b)
External Wall 1	38.9300	15.1600	23.7700	0.1800	4.2786			(29a)
Total net area of external elements Aum(A, m2)			99.5600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.1871			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	10.1650	(36)
Total fabric heat loss (33) + (36) =	40.3521	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.2426	28.0782	27.9171	27.1603	27.0187	26.3596	26.3596	26.2375	26.6135	27.0187	27.3052	27.6046	(38)
Heat transfer coeff	68.5947	68.4303	68.2692	67.5124	67.3708	66.7117	66.7117	66.5896	66.9655	67.3708	67.6572	67.9567	(39)
Average = Sum(39)m / 12 =												67.5117	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1314	1.1287	1.1260	1.1135	1.1112	1.1003	1.1003	1.0983	1.1045	1.1112	1.1159	1.1208	(40)
HLP (average)												1.1135	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.9994 (42)
Average daily hot water use (litres/day)	81.6855 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	89.8541	86.5866	83.3192	80.0518	76.7844	73.5170	73.5170	76.7844	80.0518	83.3192	86.5866	89.8541	(44)
Energy conte	133.2510	116.5422	120.2611	104.8465	100.6027	86.8125	80.4445	92.3113	93.4138	108.8648	118.8344	129.0465	(45)
Energy content (annual)										Total = Sum(45)m =		1285.2312	(45)
Distribution loss (46)m = 0.15 x (45)m	19.9876	17.4813	18.0392	15.7270	15.0904	13.0219	12.0667	13.8467	14.0121	16.3297	17.8252	19.3570	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	45.7886	39.8536	42.4586	39.4776	39.1285	36.2549	37.4634	39.1285	39.4776	42.4586	42.7003	45.7886	(61)
Total heat required for water heating calculated for each month													
	179.0396	156.3957	162.7196	144.3241	139.7312	123.0674	117.9080	131.4398	132.8914	151.3233	161.5347	174.8351	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000	(63)
Output from w/h													
	179.0396	156.3957	162.7196	144.3241	139.7312	123.0674	117.9080	131.4398	132.8914	151.3233	161.5347	174.8351	(64)
Total per year (kWh/year) = Sum(64)m =												1775.2100	(64)
Heat gains from water heating, kWh/month													
	55.7531	48.7137	50.6014	44.7309	43.2325	37.9289	36.1137	40.4756	40.9295	46.8122	50.1875	54.3551	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	20.7996	18.4740	15.0240	11.3742	8.5023	7.1780	7.7561	10.0817	13.5316	17.1815	20.0533	21.3776	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	174.5330	176.3441	171.7801	162.0641	149.7993	138.2721	130.5713	128.7602	133.3241	143.0402	155.3049	166.8321	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	(71)
Water heating gains (Table 5)													
	74.9370	72.4906	68.0127	62.1262	58.1082	52.6790	48.5399	54.4027	56.8465	62.9196	69.7049	73.0579	(72)
Total internal gains													
	326.2604	323.2995	310.8077	291.5553	272.4007	254.1200	242.8581	249.2354	259.6931	279.1321	301.0540	317.2585	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.3900	10.6334	0.6300	0.7000	0.7700	7.7668	(74)

Solar gains	7.7668	14.8427	25.2214	40.5121	54.5735	58.4225	54.5449	43.2744	30.3243	17.6683	9.5813	6.4748	(83)
Total gains	334.0271	338.1422	336.0292	332.0674	326.9742	312.5426	297.4030	292.5098	290.0174	296.8004	310.6353	323.7333	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.3811	61.5285	61.6738	62.3651	62.4962	63.1137	63.1137	63.2293	62.8744	62.4962	62.2316	61.9573	
alpha	5.0921	5.1019	5.1116	5.1577	5.1664	5.2076	5.2076	5.2153	5.1916	5.1664	5.1488	5.1305	
util living area													
	0.9987	0.9983	0.9974	0.9943	0.9831	0.9383	0.8334	0.8578	0.9649	0.9932	0.9978	0.9989	(86)
MIT	19.7380	19.8117	19.9813	20.2410	20.5240	20.7910	20.9286	20.9134	20.7154	20.3668	20.0173	19.7257	(87)
Th 2	19.9753	19.9775	19.9797	19.9898	19.9917	20.0006	20.0006	20.0022	19.9972	19.9917	19.9879	19.9838	(88)
util rest of house													
	0.9982	0.9977	0.9963	0.9915	0.9729	0.8922	0.7085	0.7460	0.9372	0.9893	0.9968	0.9985	(89)
MIT 2	18.2866	18.3960	18.6456	19.0318	19.4422	19.8141	19.9636	19.9527	19.7156	19.2169	18.7042	18.2746	(90)
Living area fraction									fLA = Living area / (4) =			0.3663	(91)
MIT	18.8183	18.9146	19.1349	19.4748	19.8385	20.1720	20.3171	20.3046	20.0818	19.6381	19.1852	18.8062	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8183	18.9146	19.1349	19.4748	19.8385	20.1720	20.3171	20.3046	20.0818	19.6381	19.1852	18.8062	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9974	0.9968	0.9951	0.9896	0.9709	0.9021	0.7543	0.7859	0.9403	0.9873	0.9957	0.9978	(94)
Useful gains	333.1739	337.0676	334.3673	328.6093	317.4472	281.9445	224.3290	229.8949	272.7062	293.0416	309.3118	323.0370	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	995.8761	959.0224	862.5734	713.9287	548.2975	371.7163	247.9743	260.0047	400.5753	608.9052	817.6497	992.5885	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	493.0505	417.9536	392.9853	277.4300	171.7526	0.0000	0.0000	0.0000	0.0000	235.0025	366.0033	498.1463	(98)
Space heating												2852.3241	(98)
Space heating per m2											(98) / (4) =	47.0448	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.4000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												3053.8802	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	493.0505	417.9536	392.9853	277.4300	171.7526	0.0000	0.0000	0.0000	0.0000	235.0025	366.0033	498.1463	(98)
Space heating efficiency (main heating system 1)													
	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)													
	527.8913	447.4878	420.7552	297.0342	183.8893	0.0000	0.0000	0.0000	0.0000	251.6087	391.8664	533.3472	(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													
	179.0396	156.3957	162.7196	144.3241	139.7312	123.0674	117.9080	131.4398	132.8914	151.3233	161.5347	174.8351	(64)
Efficiency of water heater												80.3000	(216)
(217)m	87.4692	87.4064	87.1888	86.6696	85.5717	80.3000	80.3000	80.3000	80.3000	86.1554	87.0475	87.5395	(217)
Fuel for water heating, kWh/month													
	204.6887	178.9294	186.6290	166.5221	163.2914	153.2596	146.8344	163.6859	165.4936	175.6400	185.5708	199.7213	(219)
Water heating fuel used												2090.2662	(219)
Annual totals kWh/year													
Space heating fuel - main system												3053.8802	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												367.3266	(232)
Total delivered energy for all uses												5586.4730	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3053.8802	0.2160	659.6381	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2090.2662	0.2160	451.4975	(264)
Space and water heating			1111.1356	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	367.3266	0.5190	190.6425	(268)
Total CO2, kg/m2/year			1340.7031	(272)
Emissions per m2 for space and water heating			18.3265	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			3.1444	(272b)
Emissions per m2 for pumps and fans			0.6420	(272c)
Target Carbon Dioxide Emission Rate (TER) = (18.3265 * 1.00) + 3.1444 + 0.6420, rounded to 2 d.p.			22.1100	(273)

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

Property Reference	Flat 03 - 1 Hampshire St.	**Issued on Date**	11/05/2020
Assessment Reference	AD - Gas Combi + PV	**Prop Type Ref**	
Property	Flat 3, 1 Hampshire Street, London, NW5 2TE		

SAP Rating	88 B	**DER**	14.80	**TER**	27.29
Environmental	92 A	**% DER<TER**	45.78		
CO_2 Emissions (t/year)	0.43	**DFEE**	60.67	**TFEE**	73.89
General Requirements Compliance	Pass	**% DFEE<TFEE**	17.89		

Assessor Details	Mr. Andrew Gwynne, Andrew Gwynne, Tel: 01636 653055, andrew.gwynne@mesenergyservices.co.uk	**Assessor ID**	P741-0001
Client			

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

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

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

Mid-floor flat, total floor area 41 m²

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

1a TER and DER
Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 27.29 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.80 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)73.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)60.7 kWh/m²/yrOK

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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	0.08 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.32 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated using user-specified y-value of 0.128

---
3 Air permeability
Air permeability at 50 pascals: 5.00 (design value)
Maximum 10.0 OK

---
4 Heating efficiency
Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
tbc tbc
Combi boiler
Efficiency: 89.0% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage No cylinder

---
6 Controls
Space heating controls: Time and temperature zone control OK

Hot water controls: No cylinder

Boiler interlock Yes OK

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

---
8 Mechanical ventilation
Not applicable

---
9 Summertime temperature
Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing North: 2.40 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

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10 Key features
Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Photovoltaic array 1.00 kW

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	41.1300 (1b)	x	2.4000 (2b)	=	98.7120	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	41.1300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	98.7120	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.2026	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4526	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3847	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4905	0.4809	0.4713	0.4232	0.4136	0.3655	0.3655	0.3559	0.3847	0.4136	0.4328	0.4520	(22b)
Effective ac	0.6203	0.6156	0.6111	0.5895	0.5855	0.5668	0.5668	0.5633	0.5740	0.5855	0.5937	0.6022	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 1.40)			2.4000	1.3258	3.1818			(27)
Ext Door			2.3300	1.0000	2.3300			(26)
Glazed Door			7.5800	1.4000	10.6120			(26a)
Floor Onto Commercial			31.8800	0.0650	2.0722			(28b)
Floor onto Corridor			9.2500	0.1236	1.1431			(28b)
External Wall 1	38.9300	12.3100	26.6200	0.1800	4.7916	0.0000	0.0000	(29a)
Wall to Corridor	10.8200		10.8200	0.1679	1.8168	0.0000	0.0000	(29a)
Total net area of external elements Aum(A, m2)			90.8800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	25.9475			(33)
Party Wall 1			41.3300	0.0000	0.0000	0.0000	0.0000	(32)
Party Ceilings 1			41.1300			0.0000	0.0000	(32b)
Stud Wall			60.5800			75.0000	4543.5000	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		4543.5000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							110.4668	(35)
Thermal bridges (User defined value 0.128 * total exposed area)							11.6326	(36)
Total fabric heat loss					(33) + (36) =		37.5801	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.2063	20.0542	19.9050	19.2044	19.0733	18.4631	18.4631	18.3501	18.6982	19.0733	19.3385	19.6157	(38)
Heat transfer coeff	57.7864	57.6343	57.4851	56.7845	56.6534	56.0432	56.0432	55.9302	56.2783	56.6534	56.9186	57.1958	(39)
Average = Sum(39)m / 12 =												56.7839	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4050	1.4013	1.3976	1.3806	1.3774	1.3626	1.3626	1.3598	1.3683	1.3774	1.3839	1.3906	(40)
HLP (average)												1.3806	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4367	(42)
Average daily hot water use (litres/day)												68.3212	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.1534	72.4205	69.6877	66.9548	64.2220	61.4891	61.4891	64.2220	66.9548	69.6877	72.4205	75.1534	(44)
Energy conte	111.4503	97.4751	100.5856	87.6929	84.1435	72.6094	67.2833	77.2086	78.1307	91.0538	99.3923	107.9336	(45)
Energy content (annual)										Total = Sum(45)m =		1074.9590	(45)
Distribution loss (46)m = 0.15 x (45)m													

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	16.7175	14.6213	15.0878	13.1539	12.6215	10.8914	10.0925	11.5813	11.7196	13.6581	14.9088	16.1900	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	38.2973	33.3333	35.5121	33.0188	32.7268	30.3234	31.3342	32.7268	33.0188	35.5121	35.7142	38.2973	(61)
Total heat required for water heating calculated for each month													
	149.7476	130.8084	136.0976	120.7118	116.8703	102.9328	98.6175	109.9354	111.1495	126.5658	135.1065	146.2309	(62)
WWHRS	-21.0382	-18.5044	-18.8897	-15.5862	-14.4952	-11.9740	-10.1634	-12.2956	-12.6411	-15.5951	-18.0212	-20.3245	eq.(G10)
Total of WWHRS savings												-189.5285	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h													
	128.7094	112.3040	117.2080	105.1255	102.3751	90.9588	88.4541	97.6398	98.5084	110.9707	117.0853	125.9065	(64)
								Total per year (kWh/year) = Sum(64)m =				1295.2457	(64)
Heat gains from water heating, kWh/month													
	46.6315	40.7438	42.3227	37.4126	36.1594	31.7235	30.2052	33.8536	34.2332	39.1534	41.9765	45.4623	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	71.8342	71.8342	71.8342	71.8342	71.8342	71.8342	71.8342	71.8342	71.8342	71.8342	71.8342	71.8342	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	14.1093	12.5318	10.1915	7.7156	5.7675	4.8692	5.2613	6.8389	9.1791	11.6550	13.6031	14.5015	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	124.3855	125.6763	122.4237	115.4993	106.7584	98.5433	93.0551	91.7643	95.0169	101.9414	110.6822	118.8973	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.1834	30.1834	30.1834	30.1834	30.1834	30.1834	30.1834	30.1834	30.1834	30.1834	30.1834	30.1834	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-57.4673	-57.4673	-57.4673	-57.4673	-57.4673	-57.4673	-57.4673	-57.4673	-57.4673	-57.4673	-57.4673	-57.4673	(71)
Water heating gains (Table 5)													
	62.6768	60.6306	56.8854	51.9620	48.6014	44.0604	40.5984	45.5021	47.5460	52.6255	58.3007	61.1052	(72)
Total internal gains													
	248.7219	246.3890	237.0508	222.7271	208.6776	195.0231	186.4651	191.6556	199.2924	213.7722	230.1363	242.0542	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.4000	10.6334	0.7600	0.7000	0.7700	9.4087	(74)

Solar gains	9.4087	17.9804	30.5532	49.0762	66.1101	70.7729	66.0755	52.4225	36.7348	21.4034	11.6068	7.8435	(83)
Total gains	258.1306	264.3694	267.6040	271.8033	274.7877	265.7960	252.5406	244.0781	236.0272	235.1755	241.7431	249.8978	(84)

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7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	21.8405	21.8981	21.9550	22.2258	22.2773	22.5198	22.5198	22.5653	22.4258	22.2773	22.1735	22.0660	
alpha	2.4560	2.4599	2.4637	2.4817	2.4852	2.5013	2.5013	2.5044	2.4951	2.4852	2.4782	2.4711	
util living area													
	0.9710	0.9670	0.9579	0.9370	0.8942	0.8117	0.7058	0.7332	0.8627	0.9361	0.9626	0.9732	(86)
MIT	18.8695	18.9867	19.2544	19.6595	20.0900	20.4832	20.6970	20.6684	20.3642	19.8392	19.3016	18.8520	(87)
Th 2	19.7595	19.7624	19.7651	19.7782	19.7807	19.7921	19.7921	19.7943	19.7877	19.7807	19.7757	19.7705	(88)
util rest of house													
	0.9658	0.9610	0.9495	0.9226	0.8647	0.7459	0.5840	0.6205	0.8126	0.9187	0.9547	0.9685	(89)
MIT 2	16.9307	17.1030	17.4940	18.0881	18.7027	19.2461	19.5034	19.4763	19.0928	18.3521	17.5709	16.9123	(90)
Living area fraction									fLA = Living area / (4) =			0.5400	(91)
MIT	17.9776	18.1202	18.4446	18.9366	19.4518	19.9141	20.1480	20.1200	19.7793	19.1551	18.5054	17.9597	(92)
Temperature adjustment												-0.1500	
adjusted MIT	17.8276	17.9702	18.2946	18.7866	19.3018	19.7641	19.9980	19.9700	19.6293	19.0051	18.3554	17.8097	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9550	0.9493	0.9362	0.9073	0.8502	0.7441	0.6083	0.6399	0.8044	0.9041	0.9424	0.9582	(94)
Useful gains	246.5040	250.9538	250.5241	246.6149	233.6315	197.7816	153.6112	156.1893	189.8569	212.6286	227.8258	239.4564	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	781.7138	753.2928	678.0145	561.4075	430.6683	289.4150	190.4321	199.6705	311.1810	476.1805	640.6441	778.4203	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	398.1961	337.5718	318.0529	226.6507	146.5954	0.0000	0.0000	0.0000	0.0000	196.0826	297.2291	400.9891	(98)
Space heating												2321.3677	(98)
Space heating per m2											(98) / (4) =	56.4398	(99)

8c. Space cooling requirement

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	89.9000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	2582.1665	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	398.1961	337.5718	318.0529	226.6507	146.5954	0.0000	0.0000	0.0000	0.0000	196.0826	297.2291	400.9891	(98)
Space heating efficiency (main heating system 1)													
	89.9000	89.9000	89.9000	89.9000	89.9000	0.0000	0.0000	0.0000	0.0000	89.9000	89.9000	89.9000	(210)
Space heating fuel (main heating system)													
	442.9323	375.4970	353.7852	252.1142	163.0650	0.0000	0.0000	0.0000	0.0000	218.1119	330.6219	446.0391	(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													
	128.7094	112.3040	117.2080	105.1255	102.3751	90.9588	88.4541	97.6398	98.5084	110.9707	117.0853	125.9065	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.2039	87.1466	86.9370	86.4337	85.4528	79.8000	79.8000	79.8000	79.8000	85.9677	86.7955	87.2609	(217)
Fuel for water heating, kWh/month													
	147.5959	128.8680	134.8194	121.6256	119.8032	113.9835	110.8447	122.3556	123.4442	129.0842	134.8978	144.2875	(219)
Water heating fuel used												1531.6095	(219)
Annual totals kWh/year													
Space heating fuel - main system												2582.1665	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												249.1753	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.00 * 1080 * 1.00) =										-863.6197		-863.6197	(233)
Total delivered energy for all uses												3574.3316	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2582.1665	0.2160	557.7480	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1531.6095	0.2160	330.8277	(264)
Space and water heating			888.5756	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	249.1753	0.5190	129.3220	(268)
Energy saving/generation technologies				
PV Unit	-863.6197	0.5190	-448.2186	(269)
Total CO2, kg/year			608.6040	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.8000	(273)

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

DER		14.8000	ZC1
Total Floor Area	TFA	41.1300	
Assumed number of occupants	N	1.4367	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.9208	ZC2
CO2 emissions from cooking, equation (L16)		3.7316	ZC3
Total CO2 emissions		36.4524	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		36.4524	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	41.1300 (1b)	x	2.4000 (2b)	=	98.7120	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	41.1300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	98.7120	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.2026	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4526	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3847	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4905	0.4809	0.4713	0.4232	0.4136	0.3655	0.3655	0.3559	0.3847	0.4136	0.4328	0.4520	(22b)
Effective ac	0.6203	0.6156	0.6111	0.5895	0.5855	0.5668	0.5668	0.5633	0.5740	0.5855	0.5937	0.6022	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.3300	1.0000	2.3300			(26)
TER Semi-glazed door			7.5800	1.2000	9.0960			(26a)
TER Opening Type (Uw = 1.40)			0.3700	1.3258	0.4905			(27)
Floor Onto Commercial			31.8800	0.1300	4.1444			(28b)
Floor onto Corridor			9.2500	0.1300	1.2025			(28b)
External Wall 1	38.9300	10.2800	28.6500	0.1800	5.1570			(29a)
Wall to Corridor	10.8200		10.8200	0.1800	1.9476			(29a)
Total net area of external elements Aum(A, m2)			90.8800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	24.3680			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	10.5648	(36)
Total fabric heat loss (33) + (36) =	34.9328	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.2063	20.0542	19.9050	19.2044	19.0733	18.4631	18.4631	18.3501	18.6982	19.0733	19.3385	19.6157	(38)
Heat transfer coeff	55.1392	54.9870	54.8378	54.1372	54.0062	53.3959	53.3959	53.2829	53.6310	54.0062	54.2713	54.5486	(39)
Average = Sum(39)m / 12 =												54.1366	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3406	1.3369	1.3333	1.3162	1.3131	1.2982	1.2982	1.2955	1.3039	1.3131	1.3195	1.3262	(40)
HLP (average)												1.3162	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.4367 (42)
Average daily hot water use (litres/day)	68.3212 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.1534	72.4205	69.6877	66.9548	64.2220	61.4891	61.4891	64.2220	66.9548	69.6877	72.4205	75.1534	(44)
Energy conte	111.4503	97.4751	100.5856	87.6929	84.1435	72.6094	67.2833	77.2086	78.1307	91.0538	99.3923	107.9336	(45)
Energy content (annual)										Total = Sum(45)m =		1074.9590	(45)
Distribution loss (46)m = 0.15 x (45)m	16.7175	14.6213	15.0878	13.1539	12.6215	10.8914	10.0925	11.5813	11.7196	13.6581	14.9088	16.1900	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	38.2973	33.3333	35.5121	33.0188	32.7268	30.3234	31.3342	32.7268	33.0188	35.5121	35.7142	38.2973 (61)
Total heat required for water heating calculated for each month												
	149.7476	130.8084	136.0976	120.7118	116.8703	102.9328	98.6175	109.9354	111.1495	126.5658	135.1065	146.2309 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
								Solar input (sum of months) = Sum(63)m =				0.0000 (63)
Output from w/h												
	149.7476	130.8084	136.0976	120.7118	116.8703	102.9328	98.6175	109.9354	111.1495	126.5658	135.1065	146.2309 (64)
								Total per year (kWh/year) = Sum(64)m =				1484.7741 (64)
Heat gains from water heating, kWh/month												
	46.6315	40.7438	42.3227	37.4126	36.1594	31.7235	30.2052	33.8536	34.2332	39.1534	41.9765	45.4623 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	71.8342	71.8342	71.8342	71.8342	71.8342	71.8342	71.8342	71.8342	71.8342	71.8342	71.8342	71.8342	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	16.1292	14.3258	11.6505	8.8202	6.5932	5.5663	6.0145	7.8179	10.4932	13.3235	15.5505	16.5775	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	124.3855	125.6763	122.4237	115.4993	106.7584	98.5433	93.0551	91.7643	95.0169	101.9414	110.6822	118.8973	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.1834	30.1834	30.1834	30.1834	30.1834	30.1834	30.1834	30.1834	30.1834	30.1834	30.1834	30.1834	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-57.4673	-57.4673	-57.4673	-57.4673	-57.4673	-57.4673	-57.4673	-57.4673	-57.4673	-57.4673	-57.4673	-57.4673	(71)
Water heating gains (Table 5)													
	62.6768	60.6306	56.8854	51.9620	48.6014	44.0604	40.5984	45.5021	47.5460	52.6255	58.3007	61.1052	(72)
Total internal gains													
	250.7418	248.1830	238.5098	223.8317	209.5032	195.7202	187.2183	192.6346	200.6065	215.4407	232.0837	244.1302	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	0.3700	10.6334	0.6300	0.7000	0.7700	1.2024	(74)

Solar gains	1.2024	2.2978	3.9046	6.2717	8.4486	9.0445	8.4442	6.6994	4.6946	2.7353	1.4833	1.0024	(83)
Total gains	251.9442	250.4808	242.4144	230.1034	217.9519	204.7647	195.6625	199.3340	205.3010	218.1759	233.5670	245.1326	(84)

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7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	51.8007	51.9441	52.0854	52.7594	52.8875	53.4919	53.4919	53.6053	53.2575	52.8875	52.6291	52.3616	
alpha	4.4534	4.4629	4.4724	4.5173	4.5258	4.5661	4.5661	4.5737	4.5505	4.5258	4.5086	4.4908	
util living area													
	0.9977	0.9974	0.9966	0.9942	0.9869	0.9590	0.8865	0.8939	0.9683	0.9915	0.9965	0.9980	(86)
MIT	19.5227	19.5968	19.7768	20.0552	20.3632	20.6768	20.8633	20.8512	20.6196	20.2342	19.8446	19.5138	(87)
Th 2	19.8092	19.8120	19.8149	19.8281	19.8306	19.8422	19.8422	19.8444	19.8377	19.8306	19.8256	19.8203	(88)
util rest of house													
	0.9969	0.9965	0.9952	0.9914	0.9784	0.9219	0.7668	0.7851	0.9410	0.9865	0.9950	0.9973	(89)
MIT 2	17.8570	17.9673	18.2326	18.6482	19.0970	19.5454	19.7670	19.7563	19.4651	18.9106	18.3390	17.8516	(90)
Living area fraction									fLA = Living area / (4) =			0.5400	(91)
MIT	18.7564	18.8472	19.0665	19.4080	19.7808	20.1563	20.3590	20.3475	20.0886	19.6253	19.1520	18.7492	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7564	18.8472	19.0665	19.4080	19.7808	20.1563	20.3590	20.3475	20.0886	19.6253	19.1520	18.7492	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9959	0.9954	0.9939	0.9900	0.9779	0.9347	0.8306	0.8419	0.9486	0.9853	0.9938	0.9965	(94)
Useful gains	250.9221	249.3349	240.9406	227.7911	213.1368	191.3990	162.5251	167.8194	194.7551	214.9679	232.1158	244.2649	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	797.1163	766.9161	689.1173	568.8730	436.4117	296.6865	200.7159	210.3360	321.1719	487.4221	654.0784	793.6356	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	406.3684	347.8146	333.4435	245.5790	166.1165	0.0000	0.0000	0.0000	0.0000	202.7059	303.8131	408.7318	(98)
Space heating												2414.5728	(98)
Space heating per m2											(98) / (4) =	58.7059	(99)

8c. Space cooling requirement

Not applicable

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

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.4000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2585.1958	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	406.3684	347.8146	333.4435	245.5790	166.1165	0.0000	0.0000	0.0000	0.0000	202.7059	303.8131	408.7318	(98)
Space heating efficiency (main heating system 1)													
	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)													
	435.0840	372.3925	357.0059	262.9326	177.8550	0.0000	0.0000	0.0000	0.0000	217.0298	325.2817	437.6144	(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													
	149.7476	130.8084	136.0976	120.7118	116.8703	102.9328	98.6175	109.9354	111.1495	126.5658	135.1065	146.2309	(64)
Efficiency of water heater												80.3000	(216)
(217)m	87.4386	87.3957	87.2202	86.8020	85.9361	80.3000	80.3000	80.3000	80.3000	86.2310	87.0305	87.5001	(217)
Fuel for water heating, kWh/month													
	171.2604	149.6736	156.0391	139.0656	135.9968	128.1853	122.8113	136.9058	138.4178	146.7753	155.2405	167.1210	(219)
Water heating fuel used												1747.4926	(219)
Annual totals kWh/year													
Space heating fuel - main system												2585.1958	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												284.8466	(232)
Total delivered energy for all uses												4692.5350	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2585.1958	0.2160	558.4023	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1747.4926	0.2160	377.4584	(264)
Space and water heating			935.8607	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	284.8466	0.5190	147.8354	(268)
Total CO2, kg/m2/year			1122.6211	(272)
Emissions per m2 for space and water heating			22.7537	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			3.5943	(272b)
Emissions per m2 for pumps and fans			0.9464	(272c)
Target Carbon Dioxide Emission Rate (TER) = (22.7537 * 1.00) + 3.5943 + 0.9464, rounded to 2 d.p.			27.2900	(273)

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

Property Reference	Flat 04 - 1 Hampshire St.	**Issued on Date**	11/05/2020
Assessment Reference	AD - Gas Combi + PV	**Prop Type Ref**	
Property	Flat 4, 1 Hampshire Street, London, NW5 2TE		

SAP Rating	88 B	**DER**	14.87	**TER**	26.49
Environmental	92 A	**% DER<TER**	43.86		
CO_2 Emissions (t/year)	0.44	**DFEE**	60.44	**TFEE**	70.68
General Requirements Compliance	Pass	**% DFEE<TFEE**	14.49		

Assessor Details	Mr. Andrew Gwynne, Andrew Gwynne, Tel: 01636 653055, andrew.gwynne@mesenergyservices.co.uk	**Assessor ID**	P741-0001
Client			

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

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

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

Mid-floor flat, total floor area 42 m²

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

1a TER and DER
Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 26.49 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.87 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)70.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)60.4 kWh/m²/yrOK

---
2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.13 (max. 0.25)	0.13 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.32 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated using user-specified y-value of 0.158

---
3 Air permeability
Air permeability at 50 pascals: 5.00 (design value)
Maximum 10.0 OK

---
4 Heating efficiency
Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
tbc tbc
Combi boiler
Efficiency: 89.0% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage No cylinder

---
6 Controls
Space heating controls: Time and temperature zone control OK

Hot water controls: No cylinder

Boiler interlock Yes OK

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

---
8 Mechanical ventilation
Not applicable

---
9 Summertime temperature
Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing North: 2.40 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Photovoltaic array 1.00 kW

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	42.0400 (1b)	x	2.4000 (2b)	=	100.8960	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	42.0400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	100.8960	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1982	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4482	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3810	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4858	0.4762	0.4667	0.4191	0.4096	0.3619	0.3619	0.3524	0.3810	0.4096	0.4286	0.4477	(22b)
Effective ac	0.6180	0.6134	0.6089	0.5878	0.5839	0.5655	0.5655	0.5621	0.5726	0.5839	0.5919	0.6002	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 1.40)			2.4000	1.3258	3.1818			(27)
Ext Door			2.3300	1.0000	2.3300			(26)
Glazed Door			7.5800	1.4000	10.6120			(26a)
Floor onto Corridor			19.5100	0.1236	2.4109			(28b)
Heat Loss - Ext Store			22.5300	0.1300	2.9289			(28b)
External Wall 1	26.0700	12.3100	13.7600	0.1800	2.4768	0.0000	0.0000	(29a)
Wall to Corridor	10.8200		10.8200	0.1679	1.8168	0.0000	0.0000	(29a)
Total net area of external elements Aum(A, m2)			78.9300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7572			(33)
Party Wall 1			42.5800	0.0000	0.0000	0.0000	0.0000	(32)
Party Ceilings 1			42.0400			0.0000	0.0000	(32b)
Stud Wall			60.6200			75.0000	4546.5000	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		4546.5000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							108.1470	(35)
Thermal bridges (User defined value 0.158 * total exposed area)							12.4709	(36)
Total fabric heat loss					(33) + (36) =		38.2282	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.5762	20.4236	20.2741	19.5718	19.4404	18.8287	18.8287	18.7155	19.0643	19.4404	19.7062	19.9841	(38)
Heat transfer coeff	58.8043	58.6518	58.5023	57.8000	57.6686	57.0569	57.0569	56.9436	57.2925	57.6686	57.9344	58.2123	(39)
Average = Sum(39)m / 12 =												57.7993	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3988	1.3951	1.3916	1.3749	1.3718	1.3572	1.3572	1.3545	1.3628	1.3718	1.3781	1.3847	(40)
HLP (average)												1.3749	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.4616 (42)
Average daily hot water use (litres/day)		68.9118 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.8030	73.0465	70.2901	67.5336	64.7771	62.0206	62.0206	64.7771	67.5336	70.2901	73.0465	75.8030	(44)
Energy conte	112.4137	98.3177	101.4551	88.4510	84.8708	73.2371	67.8649	77.8760	78.8061	91.8409	100.2515	108.8666	(45)
Energy content (annual)										Total = Sum(45)m =		1084.2514	(45)
Distribution loss (46)m = 0.15 x (45)m													

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	16.8621	14.7477	15.2183	13.2676	12.7306	10.9856	10.1797	11.6814	11.8209	13.7761	15.0377	16.3300	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	38.6284	33.6214	35.8190	33.3042	33.0097	30.5855	31.6050	33.0097	33.3042	35.8190	36.0229	38.6284	(61)
Total heat required for water heating calculated for each month													
	151.0421	131.9391	137.2741	121.7552	117.8805	103.8226	99.4700	110.8857	112.1103	127.6599	136.2745	147.4950	(62)
WWHRS	-21.3183	-18.7510	-19.1413	-15.7924	-14.6861	-12.1312	-10.2958	-12.4562	-12.8066	-15.8004	-18.2599	-20.5954	eq.(G10)
Total of WWHRS savings												-192.0346	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h													
	129.7237	113.1882	118.1328	105.9628	103.1944	91.6914	89.1741	98.4295	99.3037	111.8595	118.0146	126.8996	(64)
								Total per year (kWh/year) = Sum(64)m =				1305.5744	(64)
Heat gains from water heating, kWh/month													
	47.0346	41.0960	42.6886	37.7360	36.4720	31.9977	30.4663	34.1462	34.5291	39.4919	42.3394	45.8553	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	73.0775	73.0775	73.0775	73.0775	73.0775	73.0775	73.0775	73.0775	73.0775	73.0775	73.0775	73.0775	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	14.4176	12.8055	10.4142	7.8842	5.8935	4.9756	5.3763	6.9883	9.3797	11.9096	13.9003	14.8183	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	126.6961	128.0108	124.6978	117.6448	108.7416	100.3738	94.7837	93.4690	96.7820	103.8350	112.7382	121.1060	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.3078	30.3078	30.3078	30.3078	30.3078	30.3078	30.3078	30.3078	30.3078	30.3078	30.3078	30.3078	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-58.4620	-58.4620	-58.4620	-58.4620	-58.4620	-58.4620	-58.4620	-58.4620	-58.4620	-58.4620	-58.4620	-58.4620	(71)
Water heating gains (Table 5)													
	63.2186	61.1548	57.3771	52.4111	49.0215	44.4413	40.9494	45.8954	47.9571	53.0804	58.8047	61.6334	(72)
Total internal gains													
	252.2555	249.8944	240.4123	225.8634	211.5798	197.7139	189.0326	194.2759	202.0419	216.7484	233.3664	245.4809	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.4000	10.6334	0.7600	0.7000	0.7700	9.4087	(74)

Solar gains	9.4087	17.9804	30.5532	49.0762	66.1101	70.7729	66.0755	52.4225	36.7348	21.4034	11.6068	7.8435	(83)
Total gains	261.6642	267.8748	270.9655	274.9396	277.6900	268.4868	255.1081	246.6984	238.7767	238.1517	244.9732	253.3244	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	21.4766	21.5324	21.5875	21.8498	21.8996	22.1343	22.1343	22.1784	22.0433	21.8996	21.7991	21.6950	
alpha	2.4318	2.4355	2.4392	2.4567	2.4600	2.4756	2.4756	2.4786	2.4696	2.4600	2.4533	2.4463	
util living area													
	0.9703	0.9663	0.9571	0.9362	0.8936	0.8117	0.7065	0.7336	0.8620	0.9352	0.9618	0.9725	(86)
MIT	18.8455	18.9634	19.2331	19.6410	20.0753	20.4731	20.6905	20.6615	20.3536	19.8238	19.2813	18.8276	(87)
Th 2	19.7643	19.7671	19.7698	19.7826	19.7851	19.7963	19.7963	19.7984	19.7920	19.7851	19.7802	19.7751	(88)
util rest of house													
	0.9651	0.9602	0.9487	0.9218	0.8644	0.7467	0.5859	0.6220	0.8123	0.9178	0.9539	0.9678	(89)
MIT 2	16.9020	17.0752	17.4691	18.0672	18.6876	19.2380	19.5008	19.4731	19.0837	18.3356	17.5473	16.8828	(90)
Living area fraction										fLA = Living area / (4) =		0.5464	(91)
MIT	17.9639	18.1069	18.4329	18.9271	19.4458	19.9128	20.1508	20.1224	19.7776	19.1487	18.4947	17.9454	(92)
Temperature adjustment												-0.1500	
adjusted MIT	17.8139	17.9569	18.2829	18.7771	19.2958	19.7628	20.0008	19.9724	19.6276	18.9987	18.3447	17.7954	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9540	0.9482	0.9352	0.9064	0.8497	0.7445	0.6099	0.6411	0.8039	0.9030	0.9414	0.9573	(94)
Useful gains	249.6195	254.0117	253.3943	249.2013	235.9407	199.8881	155.5926	158.1608	191.9502	215.0573	230.6087	242.4975	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	794.6760	765.8109	689.3252	570.8971	438.0417	294.5758	194.0415	203.4259	316.6890	484.3424	651.4551	791.4204	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	405.5221	343.9290	324.3326	231.6210	150.3632	0.0000	0.0000	0.0000	0.0000	200.3482	303.0094	408.3987	(98)
Space heating												2367.5241	(98)
Space heating per m2											(98) / (4) =	56.3160	(99)

8c. Space cooling requirement

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.9000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2633.5084	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	405.5221	343.9290	324.3326	231.6210	150.3632	0.0000	0.0000	0.0000	0.0000	200.3482	303.0094	408.3987	(98)
Space heating efficiency (main heating system 1)													
	89.9000	89.9000	89.9000	89.9000	89.9000	0.0000	0.0000	0.0000	0.0000	89.9000	89.9000	89.9000	(210)
Space heating fuel (main heating system)													
	451.0813	382.5685	360.7704	257.6429	167.2560	0.0000	0.0000	0.0000	0.0000	222.8567	337.0516	454.2810	(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													
	129.7237	113.1882	118.1328	105.9628	103.1944	91.6914	89.1741	98.4295	99.3037	111.8595	118.0146	126.8996	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.2244	87.1682	86.9614	86.4650	85.4960	79.8000	79.8000	79.8000	79.8000	86.0002	86.8199	87.2812	(217)
Fuel for water heating, kWh/month													
	148.7242	129.8503	135.8451	122.5500	120.7008	114.9015	111.7470	123.3452	124.4408	130.0690	135.9303	145.3917	(219)
Water heating fuel used												1543.4959	(219)
Annual totals kWh/year													
Space heating fuel - main system												2633.5084	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												254.6185	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.00 * 1080 * 1.00) =										-863.6197		-863.6197	(233)
Total delivered energy for all uses												3643.0032	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2633.5084	0.2160	568.8378	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1543.4959	0.2160	333.3951	(264)
Space and water heating			902.2329	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	254.6185	0.5190	132.1470	(268)
Energy saving/generation technologies				
PV Unit	-863.6197	0.5190	-448.2186	(269)
Total CO2, kg/year			625.0863	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.8700	(273)

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

DER		14.8700	ZC1
Total Floor Area	TFA	42.0400	
Assumed number of occupants	N	1.4616	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.8586	ZC2
CO2 emissions from cooking, equation (L16)		3.6650	ZC3
Total CO2 emissions		36.3936	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		36.3936	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	42.0400 (1b)	x	2.4000 (2b)	=	100.8960	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	42.0400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	100.8960	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1982	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4482	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3810	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4858	0.4762	0.4667	0.4191	0.4096	0.3619	0.3619	0.3524	0.3810	0.4096	0.4286	0.4477	(22b)
Effective ac	0.6180	0.6134	0.6089	0.5878	0.5839	0.5655	0.5655	0.5621	0.5726	0.5839	0.5919	0.6002	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.3300	1.0000	2.3300			(26)
TER Semi-glazed door			7.5800	1.2000	9.0960			(26a)
TER Opening Type (Uw = 1.40)			0.6000	1.3258	0.7955			(27)
Floor onto Corridor			19.5100	0.1300	2.5363			(28b)
Heat Loss - Ext Store			22.5300	0.1300	2.9289			(28b)
External Wall 1	26.0700	10.5100	15.5600	0.1800	2.8008			(29a)
Wall to Corridor	10.8200		10.8200	0.1800	1.9476			(29a)
Total net area of external elements Aum(A, m2)			78.9300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.4351			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	11.3744	(36)
Total fabric heat loss (33) + (36) =	33.8095	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.5762	20.4236	20.2741	19.5718	19.4404	18.8287	18.8287	18.7155	19.0643	19.4404	19.7062	19.9841	(38)
Heat transfer coeff	54.3856	54.2331	54.0835	53.3813	53.2499	52.6382	52.6382	52.5249	52.8738	53.2499	53.5157	53.7936	(39)
Average = Sum(39)m / 12 =												53.3806	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2937	1.2900	1.2865	1.2698	1.2666	1.2521	1.2521	1.2494	1.2577	1.2666	1.2730	1.2796	(40)
HLP (average)												1.2698	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.4616 (42)
Average daily hot water use (litres/day)	68.9118 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.8030	73.0465	70.2901	67.5336	64.7771	62.0206	62.0206	64.7771	67.5336	70.2901	73.0465	75.8030	(44)
Energy conte	112.4137	98.3177	101.4551	88.4510	84.8708	73.2371	67.8649	77.8760	78.8061	91.8409	100.2515	108.8666	(45)
Energy content (annual)										Total = Sum(45)m =		1084.2514	(45)
Distribution loss (46)m = 0.15 x (45)m	16.8621	14.7477	15.2183	13.2676	12.7306	10.9856	10.1797	11.6814	11.8209	13.7761	15.0377	16.3300	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	38.6284	33.6214	35.8190	33.3042	33.0097	30.5855	31.6050	33.0097	33.3042	35.8190	36.0229	38.6284 (61)
Total heat required for water heating calculated for each month												
	151.0421	131.9391	137.2741	121.7552	117.8805	103.8226	99.4700	110.8857	112.1103	127.6599	136.2745	147.4950 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
								Solar input (sum of months) = Sum(63)m =				0.0000 (63)
Output from w/h												
	151.0421	131.9391	137.2741	121.7552	117.8805	103.8226	99.4700	110.8857	112.1103	127.6599	136.2745	147.4950 (64)
								Total per year (kWh/year) = Sum(64)m =				1497.6091 (64)
Heat gains from water heating, kWh/month												
	47.0346	41.0960	42.6886	37.7360	36.4720	31.9977	30.4663	34.1462	34.5291	39.4919	42.3394	45.8553 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	73.0775	73.0775	73.0775	73.0775	73.0775	73.0775	73.0775	73.0775	73.0775	73.0775	73.0775	73.0775	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	16.1839	14.3744	11.6900	8.8501	6.6156	5.5851	6.0349	7.8444	10.5288	13.3687	15.6033	16.6337	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	126.6961	128.0108	124.6978	117.6448	108.7416	100.3738	94.7837	93.4690	96.7820	103.8350	112.7382	121.1060	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.3078	30.3078	30.3078	30.3078	30.3078	30.3078	30.3078	30.3078	30.3078	30.3078	30.3078	30.3078	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-58.4620	-58.4620	-58.4620	-58.4620	-58.4620	-58.4620	-58.4620	-58.4620	-58.4620	-58.4620	-58.4620	-58.4620	(71)
Water heating gains (Table 5)													
	63.2186	61.1548	57.3771	52.4111	49.0215	44.4413	40.9494	45.8954	47.9571	53.0804	58.8047	61.6334	(72)
Total internal gains													
	254.0219	251.4632	241.6882	226.8293	212.3019	198.3235	189.6912	195.1321	203.1911	218.2074	235.0694	247.2963	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	0.6000	10.6334	0.6300	0.7000	0.7700	1.9498	(74)
Solar gains	1.9498	3.7262	6.3317	10.1704	13.7005	14.6667	13.6933	10.8639	7.6128	4.4356	2.4054	1.6255	(83)
Total gains	255.9717	255.1894	248.0199	236.9997	226.0023	212.9902	203.3845	205.9959	210.8039	222.6430	237.4747	248.9218	(84)

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7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	53.6805	53.8314	53.9803	54.6904	54.8254	55.4625	55.4625	55.5821	55.2153	54.8254	54.5531	54.2713	
alpha	4.5787	4.5888	4.5987	4.6460	4.6550	4.6975	4.6975	4.7055	4.6810	4.6550	4.6369	4.6181	
util living area													
	0.9978	0.9975	0.9966	0.9940	0.9857	0.9539	0.8735	0.8835	0.9661	0.9914	0.9966	0.9981	(86)
MIT	19.5788	19.6524	19.8294	20.1029	20.4040	20.7068	20.8817	20.8692	20.6469	20.2714	19.8917	19.5699	(87)
Th 2	19.8458	19.8486	19.8514	19.8646	19.8671	19.8785	19.8785	19.8807	19.8741	19.8671	19.8621	19.8569	(88)
util rest of house													
	0.9971	0.9966	0.9952	0.9910	0.9766	0.9142	0.7508	0.7722	0.9377	0.9863	0.9951	0.9975	(89)
MIT 2	17.9638	18.0734	18.3341	18.7425	19.1808	19.6115	19.8147	19.8043	19.5288	18.9896	18.4326	17.9583	(90)
Living area fraction										fLA = Living area / (4) =		0.5464	(91)
MIT	18.8462	18.9362	19.1511	19.4858	19.8492	20.2099	20.3977	20.3862	20.1397	19.6900	19.2299	18.8388	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8462	18.9362	19.1511	19.4858	19.8492	20.2099	20.3977	20.3862	20.1397	19.6900	19.2299	18.8388	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9961	0.9956	0.9940	0.9897	0.9764	0.9289	0.8173	0.8314	0.9463	0.9853	0.9940	0.9966	(94)
Useful gains	254.9821	254.0611	246.5279	234.5528	220.6720	197.8430	166.2240	171.2581	199.4811	219.3663	236.0481	248.0864	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	791.1037	761.2246	684.2152	565.0820	433.9421	295.2960	199.9019	209.3726	319.3408	484.0387	649.1382	787.4755	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	398.8745	340.8139	325.6394	237.9810	158.6730	0.0000	0.0000	0.0000	0.0000	196.9163	297.4249	401.3055	(98)
Space heating												2357.6283	(98)
Space heating per m2											(98) / (4) =	56.0806	(99)

8c. Space cooling requirement

Not applicable

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

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.4000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2524.2273	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	398.8745	340.8139	325.6394	237.9810	158.6730	0.0000	0.0000	0.0000	0.0000	196.9163	297.4249	401.3055	(98)
Space heating efficiency (main heating system 1)													
	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)													
	427.0605	364.8971	348.6503	254.7976	169.8854	0.0000	0.0000	0.0000	0.0000	210.8311	318.4420	429.6632	(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													
	151.0421	131.9391	137.2741	121.7552	117.8805	103.8226	99.4700	110.8857	112.1103	127.6599	136.2745	147.4950	(64)
Efficiency of water heater												80.3000	(216)
(217)m	87.3813	87.3343	87.1494	86.7088	85.8000	80.3000	80.3000	80.3000	80.3000	86.1387	86.9631	87.4440	(217)
Fuel for water heating, kWh/month													
	172.8541	151.0737	157.5158	140.4186	137.3899	129.2934	123.8729	138.0893	139.6143	148.2028	156.7038	168.6736	(219)
Water heating fuel used												1763.7021	(219)
Annual totals kWh/year													
Space heating fuel - main system												2524.2273	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												285.8123	(232)
Total delivered energy for all uses												4648.7417	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2524.2273	0.2160	545.2331	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1763.7021	0.2160	380.9597	(264)
Space and water heating			926.1928	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	285.8123	0.5190	148.3366	(268)
Total CO2, kg/m2/year			1113.4543	(272)
Emissions per m2 for space and water heating			22.0312	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			3.5285	(272b)
Emissions per m2 for pumps and fans			0.9259	(272c)
Target Carbon Dioxide Emission Rate (TER) = (22.0312 * 1.00) + 3.5285 + 0.9259, rounded to 2 d.p.			26.4900	(273)

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

Property Reference	Flat 05 - 1 Hampshire St.	**Issued on Date**	11/05/2020
Assessment Reference	AD - Gas Combi + PV	**Prop Type Ref**	
Property	Flat 5, 1 Hampshire Street, London, NW5 2TE		

SAP Rating	89 B	**DER**	12.93	**TER**	25.57
Environmental	93 A	**% DER<TER**	49.43		
CO_2 Emissions (t/year)	0.36	**DFEE**	54.08	**TFEE**	66.11
General Requirements Compliance	Pass	**% DFEE<TFEE**	18.20		

Assessor Details	Mr. Andrew Gwynne, Andrew Gwynne, Tel: 01636 653055, andrew.gwynne@mesenergyservices.co.uk	**Assessor ID**	P741-0001
Client			

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

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

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

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DWELLING AS DESIGNED

Mid-floor flat, total floor area 40 m²

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

1a TER and DER
Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 25.57 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.93 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)66.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)54.1 kWh/m²/yrOK

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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	0.09 (max. 0.25)	0.13 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.31 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated using user-specified y-value of 0.159

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3 Air permeability
Air permeability at 50 pascals: 5.00 (design value)
Maximum 10.0 OK

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4 Heating efficiency
Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
tbc tbc
Combi boiler
Efficiency: 89.0% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

---

5 Cylinder insulation
Hot water storage No cylinder

---

6 Controls
Space heating controls: Time and temperature zone control OK

Hot water controls: No cylinder

Boiler interlock Yes OK

---

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

---

8 Mechanical ventilation
Not applicable

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9 Summertime temperature
Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing North: 2.57 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

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10 Key features
Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Photovoltaic array 1.00 kW

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	39.7900 (1b)	x	2.4000 (2b)	=	95.4960	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.7900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	95.4960	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.2094	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4594	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3905	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4979	0.4881	0.4784	0.4296	0.4198	0.3710	0.3710	0.3612	0.3905	0.4198	0.4393	0.4589	(22b)
Effective ac	0.6240	0.6191	0.6144	0.5923	0.5881	0.5688	0.5688	0.5652	0.5763	0.5881	0.5965	0.6053	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 1.40)			2.5700	1.3258	3.4072			(27)
Ext Door			2.3300	1.0000	2.3300			(26)
Glazed Door			5.6200	1.4000	7.8680			(26a)
Floor Onto Commercial			21.7400	0.0650	1.4131			(28b)
Floor onto Corridor			3.3400	0.1236	0.4127			(28b)
Heat Loss - Ext Store			14.7100	0.1300	1.9123			(28b)
External Wall 1	30.9900	10.5200	20.4700	0.1800	3.6846	0.0000	0.0000	(29a)
Total net area of external elements Aum(A, m2)			70.7800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.0279			(33)
Party Wall 1			52.0000	0.0000	0.0000	0.0000	0.0000	(32)
Party Ceilings 1			39.7900			0.0000	0.0000	(32b)
Stud Wall			52.0800			75.0000	3906.0000	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		3906.0000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							98.1654	(35)
Thermal bridges (User defined value 0.159 * total exposed area)							11.2540	(36)
Total fabric heat loss					(33) + (36) =		32.2820	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.6632	19.5115	19.3628	18.6645	18.5338	17.9255	17.9255	17.8129	18.1598	18.5338	18.7981	19.0745	(38)
Heat transfer coeff	51.9451	51.7935	51.6448	50.9464	50.8157	50.2075	50.2075	50.0948	50.4418	50.8157	51.0801	51.3564	(39)
Average = Sum(39)m / 12 =												50.9458	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3055	1.3017	1.2979	1.2804	1.2771	1.2618	1.2618	1.2590	1.2677	1.2771	1.2837	1.2907	(40)
HLP (average)												1.2804	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.4008	(42)
Average daily hot water use (litres/day)	67.4682	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	74.2150	71.5163	68.8175	66.1188	63.4201	60.7214	60.7214	63.4201	66.1188	68.8175	71.5163	74.2150	(44)
Energy conte	110.0587	96.2580	99.3297	86.5980	83.0929	71.7028	66.4432	76.2445	77.1551	89.9169	98.1513	106.5860	(45)
Energy content (annual)										Total = Sum(45)m =		1061.5372	(45)

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

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	16.5088	14.4387	14.8995	12.9897	12.4639	10.7554	9.9665	11.4367	11.5733	13.4875	14.7227	15.9879	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	37.8191	32.9171	35.0687	32.6065	32.3182	29.9448	30.9429	32.3182	32.6065	35.0687	35.2683	37.8191	(61)
Total heat required for water heating calculated for each month													
	147.8778	129.1751	134.3983	119.2046	115.4110	101.6476	97.3861	108.5627	109.7617	124.9856	133.4196	144.4051	(62)
WWHRS	-20.6335	-18.1481	-18.5262	-15.2885	-14.2193	-11.7469	-9.9721	-12.0637	-12.4020	-15.2987	-17.6766	-19.9331	eq.(G10)
Total of WWHRS savings												-185.9086	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h													
	127.2443	111.0270	115.8721	103.9161	101.1917	89.9007	87.4141	96.4990	97.3597	109.6869	115.7430	124.4721	(64)
								Total per year (kWh/year) = Sum(64)m =				1280.3267	(64)
Heat gains from water heating, kWh/month													
	46.0493	40.2351	41.7943	36.9455	35.7079	31.3274	29.8281	33.4309	33.8057	38.6645	41.4524	44.8946	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	70.0383	70.0383	70.0383	70.0383	70.0383	70.0383	70.0383	70.0383	70.0383	70.0383	70.0383	70.0383	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	13.5132	12.0023	9.7609	7.3897	5.5239	4.6635	5.0390	6.5499	8.7913	11.1626	13.0284	13.8888	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	121.0056	122.2613	119.0971	112.3608	103.8575	95.8656	90.5265	89.2708	92.4351	99.1713	107.6746	115.6665	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.0038	30.0038	30.0038	30.0038	30.0038	30.0038	30.0038	30.0038	30.0038	30.0038	30.0038	30.0038	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-56.0306	-56.0306	-56.0306	-56.0306	-56.0306	-56.0306	-56.0306	-56.0306	-56.0306	-56.0306	-56.0306	-56.0306	(71)
Water heating gains (Table 5)													
	61.8942	59.8736	56.1751	51.3132	47.9945	43.5103	40.0915	44.9339	46.9524	51.9685	57.5728	60.3422	(72)
Total internal gains													
	243.4245	241.1487	232.0446	218.0751	204.3874	191.0508	182.6686	187.7662	195.1902	209.3138	225.2873	236.9090	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.5700	10.6334	0.7600	0.7000	0.7700	10.0751	(74)

Solar gains	10.0751	19.2541	32.7173	52.5524	70.7929	75.7859	70.7559	56.1358	39.3368	22.9194	12.4289	8.3991	(83)
Total gains	253.4996	260.4027	264.7619	270.6275	275.1803	266.8367	253.4244	243.9020	234.5271	232.2333	237.7162	245.3081	(84)

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7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	20.8874	20.9486	21.0089	21.2969	21.3517	21.6103	21.6103	21.6589	21.5099	21.3517	21.2412	21.1269	
alpha	2.3925	2.3966	2.4006	2.4198	2.4234	2.4407	2.4407	2.4439	2.4340	2.4234	2.4161	2.4085	
util living area													
	0.9621	0.9569	0.9451	0.9186	0.8664	0.7719	0.6593	0.6892	0.8319	0.9187	0.9516	0.9649	(86)
MIT	18.8745	18.9979	19.2744	19.6915	20.1262	20.5123	20.7139	20.6860	20.3899	19.8623	19.3155	18.8572	(87)
Th 2	19.8365	19.8395	19.8425	19.8562	19.8588	19.8709	19.8709	19.8731	19.8662	19.8588	19.8536	19.8481	(88)
util rest of house													
	0.9562	0.9500	0.9355	0.9024	0.8349	0.7064	0.5460	0.5831	0.7805	0.8995	0.9426	0.9594	(89)
MIT 2	17.0022	17.1832	17.5864	18.1969	18.8144	19.3448	19.5861	19.5601	19.1888	18.4481	17.6553	16.9844	(90)
Living area fraction									fLA = Living area / (4) =			0.4569	(91)
MIT	17.8576	18.0123	18.3576	18.8798	19.4138	19.8783	20.1014	20.0745	19.7375	19.0942	18.4138	17.8401	(92)
Temperature adjustment												-0.1500	
adjusted MIT	17.7076	17.8623	18.2076	18.7298	19.2638	19.7283	19.9514	19.9245	19.5875	18.9442	18.2638	17.6901	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9414	0.9341	0.9176	0.8820	0.8145	0.6966	0.5553	0.5887	0.7649	0.8795	0.9259	0.9454	(94)
Useful gains	238.6522	243.2429	242.9473	238.6809	224.1414	185.8760	140.7239	143.5929	179.3892	204.2520	220.0910	231.9198	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	696.4613	671.3641	604.6388	500.7920	384.3586	257.4769	168.2652	176.5595	276.8017	424.0177	570.2502	692.8009	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	340.6099	287.6975	269.0985	188.7200	119.2017	0.0000	0.0000	0.0000	0.0000	163.5057	252.1146	342.8956	(98)
Space heating												1963.8433	(98)
Space heating per m2											(98) / (4) =	49.3552	(99)

8c. Space cooling requirement

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.9000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2184.4753	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	340.6099	287.6975	269.0985	188.7200	119.2017	0.0000	0.0000	0.0000	0.0000	163.5057	252.1146	342.8956	(98)
Space heating efficiency (main heating system 1)													
	89.9000	89.9000	89.9000	89.9000	89.9000	0.0000	0.0000	0.0000	0.0000	89.9000	89.9000	89.9000	(210)
Space heating fuel (main heating system)													
	378.8765	320.0194	299.3309	209.9221	132.5936	0.0000	0.0000	0.0000	0.0000	181.8751	280.4389	381.4189	(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													
	127.2443	111.0270	115.8721	103.9161	101.1917	89.9007	87.4141	96.4990	97.3597	109.6869	115.7430	124.4721	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.9084	86.8395	86.6009	86.0333	84.9627	79.8000	79.8000	79.8000	79.8000	85.5525	86.4570	86.9685	(217)
Fuel for water heating, kWh/month													
	146.4121	127.8531	133.8001	120.7859	119.1014	112.6575	109.5414	120.9261	122.0046	128.2100	133.8735	143.1232	(219)
Water heating fuel used												1518.2889	(219)
Annual totals kWh/year													
Space heating fuel - main system												2184.4753	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												238.6475	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.00 * 1080 * 1.00) =										-863.6197		-863.6197	(233)
Total delivered energy for all uses												3152.7920	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2184.4753	0.2160	471.8467	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1518.2889	0.2160	327.9504	(264)
Space and water heating			799.7971	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	238.6475	0.5190	123.8580	(268)
Energy saving/generation technologies				
PV Unit	-863.6197	0.5190	-448.2186	(269)
Total CO2, kg/year			514.3615	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			12.9300	(273)

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

DER		12.9300	ZC1
Total Floor Area	TFA	39.7900	
Assumed number of occupants	N	1.4008	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		18.0210	ZC2
CO2 emissions from cooking, equation (L16)		3.8356	ZC3
Total CO2 emissions		34.7866	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		34.7866	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	39.7900 (1b)	x	2.4000 (2b)	=	95.4960	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.7900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	95.4960	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.2094	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4594	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3905	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4979	0.4881	0.4784	0.4296	0.4198	0.3710	0.3710	0.3612	0.3905	0.4198	0.4393	0.4589	(22b)
Effective ac	0.6240	0.6191	0.6144	0.5923	0.5881	0.5688	0.5688	0.5652	0.5763	0.5881	0.5965	0.6053	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.3300	1.0000	2.3300			(26)
TER Semi-glazed door			5.6200	1.2000	6.7440			(26a)
TER Opening Type (Uw = 1.40)			2.0000	1.3258	2.6515			(27)
Floor Onto Commercial			21.7400	0.1300	2.8262			(28b)
Floor onto Corridor			3.3400	0.1300	0.4342			(28b)
Heat Loss - Ext Store			14.7100	0.1300	1.9123			(28b)
External Wall 1	30.9900	9.9500	21.0400	0.1800	3.7872			(29a)
Total net area of external elements Aum(A, m2)			70.7800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	20.6854			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	10.1426	(36)
Total fabric heat loss (33) + (36) =	30.8280	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.6632	19.5115	19.3628	18.6645	18.5338	17.9255	17.9255	17.8129	18.1598	18.5338	18.7981	19.0745	(38)
Heat transfer coeff	50.4912	50.3395	50.1908	49.4925	49.3618	48.7535	48.7535	48.6409	48.9878	49.3618	49.6261	49.9025	(39)
Average = Sum(39)m / 12 =												49.4918	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2689	1.2651	1.2614	1.2438	1.2406	1.2253	1.2253	1.2224	1.2312	1.2406	1.2472	1.2541	(40)
HLP (average)												1.2438	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.4008 (42)
Average daily hot water use (litres/day)	67.4682 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	74.2150	71.5163	68.8175	66.1188	63.4201	60.7214	60.7214	63.4201	66.1188	68.8175	71.5163	74.2150	(44)
Energy conte	110.0587	96.2580	99.3297	86.5980	83.0929	71.7028	66.4432	76.2445	77.1551	89.9169	98.1513	106.5860	(45)
Energy content (annual)										Total = Sum(45)m =		1061.5372	(45)
Distribution loss (46)m = 0.15 x (45)m	16.5088	14.4387	14.8995	12.9897	12.4639	10.7554	9.9665	11.4367	11.5733	13.4875	14.7227	15.9879	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	37.8191	32.9171	35.0687	32.6065	32.3182	29.9448	30.9429	32.3182	32.6065	35.0687	37.8191	(61)
Total heat required for water heating calculated for each month												
	147.8778	129.1751	134.3983	119.2046	115.4110	101.6476	97.3861	108.5627	109.7617	124.9856	133.4196	144.4051 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =			0.0000	(63)
Output from w/h												
	147.8778	129.1751	134.3983	119.2046	115.4110	101.6476	97.3861	108.5627	109.7617	124.9856	133.4196	144.4051 (64)
								Total per year (kWh/year) = Sum(64)m =			1466.2353	(64)
Heat gains from water heating, kWh/month												
	46.0493	40.2351	41.7943	36.9455	35.7079	31.3274	29.8281	33.4309	33.8057	38.6645	41.4524	44.8946 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	70.0383	70.0383	70.0383	70.0383	70.0383	70.0383	70.0383	70.0383	70.0383	70.0383	70.0383	70.0383	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	14.0137	12.4468	10.1224	7.6633	5.7284	4.8362	5.2257	6.7925	9.1169	11.5760	13.5109	14.4032	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	121.0056	122.2613	119.0971	112.3608	103.8575	95.8656	90.5265	89.2708	92.4351	99.1713	107.6746	115.6665	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.0038	30.0038	30.0038	30.0038	30.0038	30.0038	30.0038	30.0038	30.0038	30.0038	30.0038	30.0038	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-56.0306	-56.0306	-56.0306	-56.0306	-56.0306	-56.0306	-56.0306	-56.0306	-56.0306	-56.0306	-56.0306	-56.0306	(71)
Water heating gains (Table 5)													
	61.8942	59.8736	56.1751	51.3132	47.9945	43.5103	40.0915	44.9339	46.9524	51.9685	57.5728	60.3422	(72)
Total internal gains													
	243.9250	241.5932	232.4061	218.3488	204.5919	191.2235	182.8552	188.0088	195.5158	209.7273	225.7698	237.4234	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.0000	10.6334	0.6300	0.7000	0.7700	6.4994	(74)

Solar gains	6.4994	12.4207	21.1058	33.9013	45.6682	48.8892	45.6443	36.2129	25.3760	14.7852	8.0179	5.4182	(83)
Total gains	250.4244	254.0139	253.5119	252.2501	250.2601	240.1127	228.4994	224.2217	220.8918	224.5125	233.7876	242.8416	(84)

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7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	54.7262	54.8912	55.0538	55.8306	55.9784	56.6768	56.6768	56.8080	56.4057	55.9784	55.6802	55.3719	
alpha	4.6484	4.6594	4.6703	4.7220	4.7319	4.7785	4.7785	4.7872	4.7604	4.7319	4.7120	4.6915	
util living area													
	0.9975	0.9969	0.9953	0.9902	0.9734	0.9155	0.7998	0.8263	0.9500	0.9887	0.9960	0.9979	(86)
MIT	19.6291	19.7118	19.9001	20.1899	20.4997	20.7853	20.9261	20.9104	20.7019	20.3234	19.9402	19.6194	(87)
Th 2	19.8652	19.8682	19.8712	19.8851	19.8877	19.8998	19.8998	19.9021	19.8952	19.8877	19.8824	19.8769	(88)
util rest of house													
	0.9966	0.9958	0.9934	0.9856	0.9579	0.8558	0.6592	0.6982	0.9121	0.9823	0.9943	0.9971	(89)
MIT 2	18.0505	18.1734	18.4506	18.8822	19.3284	19.7195	19.8649	19.8550	19.6144	19.0786	18.5172	18.0443	(90)
Living area fraction									fLA = Living area / (4) =			0.4569	(91)
MIT	18.7718	18.8763	19.1129	19.4797	19.8636	20.2064	20.3497	20.3372	20.1112	19.6473	19.1674	18.7640	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7718	18.8763	19.1129	19.4797	19.8636	20.2064	20.3497	20.3372	20.1112	19.6473	19.1674	18.7640	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9955	0.9944	0.9916	0.9833	0.9574	0.8759	0.7240	0.7563	0.9214	0.9804	0.9927	0.9961	(94)
Useful gains	249.2877	252.6008	251.3833	248.0299	239.6107	210.3038	165.4359	169.5679	203.5359	220.1163	232.0854	241.8953	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	730.6964	703.5595	633.0500	523.6137	402.9698	273.3341	182.8127	191.5099	294.4779	446.5918	598.8578	726.7778	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	358.1681	303.0443	283.9601	198.4204	121.5391	0.0000	0.0000	0.0000	0.0000	168.4978	264.0762	360.7526	(98)
Space heating												2058.4585	(98)
Space heating per m2											(98) / (4) =	51.7331	(99)

8c. Space cooling requirement

Not applicable

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

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.4000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2203.9170	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	358.1681	303.0443	283.9601	198.4204	121.5391	0.0000	0.0000	0.0000	0.0000	168.4978	264.0762	360.7526	(98)
Space heating efficiency (main heating system 1)													
	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)													
	383.4776	324.4585	304.0258	212.4415	130.1275	0.0000	0.0000	0.0000	0.0000	180.4045	282.7368	386.2448	(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													
	147.8778	129.1751	134.3983	119.2046	115.4110	101.6476	97.3861	108.5627	109.7617	124.9856	133.4196	144.4051	(64)
Efficiency of water heater												80.3000	(216)
(217)m	87.1951	87.1249	86.8891	86.3251	85.1815	80.3000	80.3000	80.3000	80.3000	85.8039	86.7381	87.2625	(217)
Fuel for water heating, kWh/month													
	169.5942	148.2643	154.6780	138.0880	135.4883	126.5848	121.2779	135.1964	136.6895	145.6642	153.8189	165.4837	(219)
Water heating fuel used												1730.8281	(219)
Annual totals kWh/year													
Space heating fuel - main system												2203.9170	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												247.4859	(232)
Total delivered energy for all uses												4257.2310	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2203.9170	0.2160	476.0461	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1730.8281	0.2160	373.8589	(264)
Space and water heating			849.9049	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	247.4859	0.5190	128.4452	(268)
Total CO2, kg/m2/year			1017.2751	(272)
Emissions per m2 for space and water heating			21.3598	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			3.2281	(272b)
Emissions per m2 for pumps and fans			0.9783	(272c)
Target Carbon Dioxide Emission Rate (TER) = (21.3598 * 1.00) + 3.2281 + 0.9783, rounded to 2 d.p.			25.5700	(273)

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

Property Reference	Flat 06 - 1 Hampshire St.	**Issued on Date**	11/05/2020
Assessment Reference	AD - Gas Combi + PV	**Prop Type Ref**	
Property	Flat 6, 1 Hampshire Street, London, NW5 2TE		

SAP Rating	88 B	**DER**	14.54	**TER**	21.04
Environmental	89 B	**% DER<TER**	30.89		
CO_2 Emissions (t/year)	0.93	**DFEE**	50.96	**TFEE**	63.48
General Requirements Compliance	Pass	**% DFEE<TFEE**	19.71		

Assessor Details	Mr. Andrew Gwynne, Andrew Gwynne, Tel: 01636 653055, andrew.gwynne@mesenergyservices.co.uk	**Assessor ID**	P741-0001
Client			

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

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

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

Mid-floor flat, total floor area 87 m²

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

1a TER and DER
Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 21.04 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.54 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)63.5 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)51.0 kWh/m²/yrOK

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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	0.07 (max. 0.25)	0.07 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.34 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated using user-specified y-value of 0.116

---
3 Air permeability
Air permeability at 50 pascals: 5.00 (design value)
Maximum 10.0 OK

---
4 Heating efficiency
Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
tbc tbc
Combi boiler
Efficiency: 89.0% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage No cylinder

---
6 Controls
Space heating controls: Time and temperature zone control OK

Hot water controls: No cylinder

Boiler interlock Yes OK

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

---
8 Mechanical ventilation
Not applicable

---
9 Summertime temperature
Overheating risk (Thames Valley): Not significant OK
Based on:
Overshading: Average
Windows facing North: 1.92 m², No overhang
Windows facing West: 2.40 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Photovoltaic array 1.00 kW

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	87.0200 (1b)	x	2.4000 (2b)	=	208.8480	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.0200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	208.8480	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1436	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3936	(18)
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3641	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4643	0.4552	0.4460	0.4005	0.3914	0.3459	0.3459	0.3368	0.3641	0.3914	0.4096	0.4278	(22b)
Effective ac	0.6078	0.6036	0.5995	0.5802	0.5766	0.5598	0.5598	0.5567	0.5663	0.5766	0.5839	0.5915	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 1.40)			4.3200	1.3258	5.7273			(27)
Ext Door			2.3300	1.0000	2.3300			(26)
Glazed Door			10.0800	1.4000	14.1120			(26a)
Floor Onto Commercial			87.0200	0.0650	5.6563			(28b)
External Wall 1	79.5400	16.7300	62.8100	0.1800	11.3058	0.0000	0.0000	(29a)
Total net area of external elements Aum(A, m2)			166.5600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.1314			(33)
Party Wall 1			33.1600	0.0000	0.0000	0.0000	0.0000	(32)
Party Ceilings 1			87.0200			0.0000	0.0000	(32b)
Stud Wall			169.4400			75.0000	12708.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12708.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		146.0354 (35)
Thermal bridges (User defined value 0.116 * total exposed area)		19.3210 (36)
Total fabric heat loss	(33) + (36) =	58.4523 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	41.8872	41.5988	41.3161	39.9882	39.7398	38.5833	38.5833	38.3691	39.0288	39.7398	40.2424	40.7678	(38)
Heat transfer coeff	100.3395	100.0511	99.7684	98.4406	98.1921	97.0356	97.0356	96.8215	97.4811	98.1921	98.6947	99.2201	(39)
Average = Sum(39)m / 12 =												98.4394	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1531	1.1497	1.1465	1.1312	1.1284	1.1151	1.1151	1.1126	1.1202	1.1284	1.1342	1.1402	(40)
HLP (average)												1.1312	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5827 (42)
Average daily hot water use (litres/day)	95.5390 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	105.0929	101.2713	97.4498	93.6282	89.8067	85.9851	85.9851	89.8067	93.6282	97.4498	101.2713	105.0929	(44)
Energy conte	155.8497	136.3072	140.6568	122.6280	117.6645	101.5355	94.0876	107.9669	109.2563	127.3277	138.9882	150.9322	(45)
Energy content (annual)										Total = Sum(45)m =		1503.2006	(45)
Distribution loss (46)m = 0.15 x (45)m	23.3775	20.4461	21.0985	18.3942	17.6497	15.2303	14.1131	16.1950	16.3885	19.0992	20.8482	22.6398	(46)
Water storage loss:													

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Total storage loss
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (56)
If cylinder contains dedicated solar storage
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (57)
Combi loss 50.9589 46.0274 49.6593 46.1728 45.7645 42.4036 43.8171 45.7645 46.1728 49.6593 49.3151 50.9589 (61)
Total heat required for water heating calculated for each month
206.8086 182.3346 190.3161 168.8008 163.4290 143.9391 137.9046 153.7314 155.4292 176.9871 188.3032 201.8911 (62)
WWHRS -35.8351 -31.5298 -32.1805 -26.4806 -24.5896 -20.2864 -17.1714 -20.7898 -21.3953 -26.4463 -30.6310 -34.6354 eq.(G10)
Total of WWHRS savings -321.9712
Solar input 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)
Output from w/h
170.9736 150.8048 158.1357 142.3202 138.8394 123.6527 120.7333 132.9416 134.0339 150.5408 157.6722 167.2556 (64)
Total per year (kWh/year) = Sum(64)m = 1747.9037 (64)
Heat gains from water heating, kWh/month
64.5598 56.8290 59.1832 52.3170 50.5646 44.3615 42.2384 47.3401 47.8709 54.7513 58.5423 62.9247 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	129.1347	129.1347	129.1347	129.1347	129.1347	129.1347	129.1347	129.1347	129.1347	129.1347	129.1347	129.1347	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
27.0838 24.0556 19.5633 14.8107 11.0712 9.3468 10.0995 13.1277 17.6200 22.3726 26.1121 27.8366 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
233.4873 235.9101 229.8046 216.8066 200.3990 184.9781 174.6760 172.2532 178.3587 191.3567 207.7643 223.1852 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
35.9135 35.9135 35.9135 35.9135 35.9135 35.9135 35.9135 35.9135 35.9135 35.9135 35.9135 35.9135 (69)
Pumps, fans 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-103.3078 -103.3078 -103.3078 -103.3078 -103.3078 -103.3078 -103.3078 -103.3078 -103.3078 -103.3078 -103.3078 -103.3078 (71)
Water heating gains (Table 5)
86.7739 84.5669 79.5473 72.6625 67.9631 61.6131 56.7720 63.6292 66.4874 73.5905 81.3088 84.5762 (72)
Total internal gains
412.0854 409.2731 393.6557 369.0202 344.1737 320.6784 306.2880 313.7505 327.2065 352.0602 379.9257 400.3383 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.9200	10.6334	0.7600	0.7000	0.7700	7.5269	(74)
West	2.4000	19.6403	0.7600	0.7000	0.7700	17.3781	(80)

Solar gains 24.9051 48.3797 80.4280 120.9125 152.9551 159.0546 150.3840 125.7093 94.5013 57.4610 30.9539 20.5658 (83)
Total gains 436.9905 457.6528 474.0837 489.9327 497.1288 479.7331 456.6720 439.4598 421.7078 409.5212 410.8796 420.9041 (84)

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7. Mean internal temperature (heating season)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	35.1806	35.2820	35.3819	35.8592	35.9499	36.3784	36.3784	36.4589	36.2121	35.9499	35.7669	35.5775	
alpha	3.3454	3.3521	3.3588	3.3906	3.3967	3.4252	3.4252	3.4306	3.4141	3.3967	3.3845	3.3718	
util living area	0.9917	0.9894	0.9840	0.9704	0.9380	0.8620	0.7473	0.7794	0.9132	0.9726	0.9881	0.9928	(86)
MIT	19.4226	19.5231	19.7367	20.0530	20.3785	20.6686	20.8169	20.7961	20.5714	20.1650	19.7506	19.4098	(87)
Th 2	19.9577	19.9604	19.9630	19.9754	19.9777	19.9885	19.9885	19.9905	19.9844	19.9777	19.9730	19.9681	(88)
util rest of house	0.9900	0.9871	0.9802	0.9623	0.9174	0.8061	0.6346	0.6766	0.8753	0.9635	0.9851	0.9912	(89)
MIT 2	17.8306	17.9791	18.2924	18.7604	19.2276	19.6304	19.8036	19.7856	19.5045	18.9265	18.3207	17.8193	(90)
Living area fraction									fLA = Living area / (4) =			0.3372	(91)
MIT	18.3674	18.4996	18.7794	19.1962	19.6157	19.9805	20.1453	20.1263	19.8643	19.3441	18.8028	18.3556	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.2174	18.3496	18.6294	19.0462	19.4657	19.8305	19.9953	19.9763	19.7143	19.1941	18.6528	18.2056	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9858	0.9821	0.9734	0.9524	0.9040	0.7953	0.6355	0.6748	0.8621	0.9539	0.9795	0.9875	(94)
Useful gains	430.7912	449.4515	461.4844	466.6052	449.3869	381.5386	290.2159	296.5545	363.5703	390.6520	402.4770	415.6462	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1396.4627	1345.6512	1210.1288	998.8011	762.5266	507.5411	329.4640	346.2611	547.2835	843.8747	1140.1977	1389.6327	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	718.4596	602.2462	556.9915	383.1811	232.9759	0.0000	0.0000	0.0000	0.0000	337.1977	531.1589	724.6460	(98)
Space heating												4086.8567	(98)
Space heating per m2											(98) / (4) =	46.9646	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.9000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												4546.0030	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	718.4596	602.2462	556.9915	383.1811	232.9759	0.0000	0.0000	0.0000	0.0000	337.1977	531.1589	724.6460	(98)
Space heating efficiency (main heating system 1)													
	89.9000	89.9000	89.9000	89.9000	89.9000	0.0000	0.0000	0.0000	0.0000	89.9000	89.9000	89.9000	(210)
Space heating fuel (main heating system)													
	799.1764	669.9068	619.5678	426.2303	259.1501	0.0000	0.0000	0.0000	0.0000	375.0808	590.8330	806.0578	(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													
	170.9736	150.8048	158.1357	142.3202	138.8394	123.6527	120.7333	132.9416	134.0339	150.5408	157.6722	167.2556	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.7647	87.6777	87.4524	86.9206	85.8430	79.8000	79.8000	79.8000	79.8000	86.5201	87.3689	87.8157	(217)
Fuel for water heating, kWh/month													
	194.8090	171.9990	180.8248	163.7360	161.7365	154.9532	151.2948	166.5934	167.9623	173.9951	180.4673	190.4620	(219)
Water heating fuel used												2058.8335	(219)
Annual totals kWh/year													
Space heating fuel - main system												4546.0030	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												478.3088	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.00 * 1080 * 1.00) =										-863.6197		-863.6197	(233)
Total delivered energy for all uses												6294.5256	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4546.0030	0.2160	981.9367	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2058.8335	0.2160	444.7080	(264)
Space and water heating			1426.6447	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	478.3088	0.5190	248.2423	(268)
Energy saving/generation technologies				
PV Unit	-863.6197	0.5190	-448.2186	(269)
Total CO2, kg/year			1265.5933	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.5400	(273)

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

DER		14.5400	ZC1
Total Floor Area	TFA	87.0200	
Assumed number of occupants	N	2.5827	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		15.8998	ZC2
CO2 emissions from cooking, equation (L16)		2.0798	ZC3
Total CO2 emissions		32.5196	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		32.5196	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	87.0200 (1b)	x	2.4000 (2b)	=	208.8480	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.0200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	208.8480	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1436	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3936	(18)
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3641	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4643	0.4552	0.4460	0.4005	0.3914	0.3459	0.3459	0.3368	0.3641	0.3914	0.4096	0.4278	(22b)
Effective ac	0.6078	0.6036	0.5995	0.5802	0.5766	0.5598	0.5598	0.5567	0.5663	0.5766	0.5839	0.5915	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.3300	1.0000	2.3300			(26)
TER Semi-glazed door			10.0800	1.2000	12.0960			(26a)
TER Opening Type (Uw = 1.40)			4.3200	1.3258	5.7273			(27)
Floor Onto Commercial			87.0200	0.1300	11.3126			(28b)
External Wall 1	79.5400	16.7300	62.8100	0.1800	11.3058			(29a)
Total net area of external elements Aum(A, m2)			166.5600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.7717			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	17.4943	(36)
Total fabric heat loss (33) + (36) =	60.2660	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	41.8872	41.5988	41.3161	39.9882	39.7398	38.5833	38.5833	38.3691	39.0288	39.7398	40.2424	40.7678	(38)
Heat transfer coeff	102.1531	101.8647	101.5820	100.2542	100.0058	98.8493	98.8493	98.6351	99.2947	100.0058	100.5084	101.0338	(39)
Average = Sum(39)m / 12 =												100.2530	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1739	1.1706	1.1673	1.1521	1.1492	1.1359	1.1359	1.1335	1.1411	1.1492	1.1550	1.1610	(40)
HLP (average)												1.1521	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5827 (42)
Average daily hot water use (litres/day)	95.5390 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	105.0929	101.2713	97.4498	93.6282	89.8067	85.9851	85.9851	89.8067	93.6282	97.4498	101.2713	105.0929	(44)
Energy conte	155.8497	136.3072	140.6568	122.6280	117.6645	101.5355	94.0876	107.9669	109.2563	127.3277	138.9882	150.9322	(45)
Energy content (annual)										Total = Sum(45)m =		1503.2006	(45)
Distribution loss (46)m = 0.15 x (45)m	23.3775	20.4461	21.0985	18.3942	17.6497	15.2303	14.1131	16.1950	16.3885	19.0992	20.8482	22.6398	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	50.9589	46.0274	49.6593	46.1728	45.7645	42.4036	43.8171	45.7645	46.1728	49.6593	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	206.8086	182.3346	190.3161	168.8008	163.4290	143.9391	137.9046	153.7314	155.4292	176.9871	188.3032	201.8911	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h													
	206.8086	182.3346	190.3161	168.8008	163.4290	143.9391	137.9046	153.7314	155.4292	176.9871	188.3032	201.8911	(64)
									Total per year (kWh/year) = Sum(64)m =			2069.8748	(64)
Heat gains from water heating, kWh/month													
	64.5598	56.8290	59.1832	52.3170	50.5646	44.3615	42.2384	47.3401	47.8709	54.7513	58.5423	62.9247	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	129.1347	129.1347	129.1347	129.1347	129.1347	129.1347	129.1347	129.1347	129.1347	129.1347	129.1347	129.1347	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.0838	24.0556	19.5633	14.8107	11.0712	9.3468	10.0995	13.1277	17.6200	22.3726	26.1121	27.8366	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	233.4873	235.9101	229.8046	216.8066	200.3990	184.9781	174.6760	172.2532	178.3587	191.3567	207.7643	223.1852	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.9135	35.9135	35.9135	35.9135	35.9135	35.9135	35.9135	35.9135	35.9135	35.9135	35.9135	35.9135	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.3078	-103.3078	-103.3078	-103.3078	-103.3078	-103.3078	-103.3078	-103.3078	-103.3078	-103.3078	-103.3078	-103.3078	(71)
Water heating gains (Table 5)													
	86.7739	84.5669	79.5473	72.6625	67.9631	61.6131	56.7720	63.6292	66.4874	73.5905	81.3088	84.5762	(72)
Total internal gains													
	412.0854	409.2731	393.6557	369.0202	344.1737	320.6784	306.2880	313.7505	327.2065	352.0602	379.9257	400.3383	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.9200	10.6334	0.6300	0.7000	0.7700	6.2394	(74)
West	2.4000	19.6403	0.6300	0.7000	0.7700	14.4056	(80)

Solar gains	20.6450	40.1042	66.6706	100.2301	126.7917	131.8479	124.6604	104.2064	78.3366	47.6322	25.6592	17.0479	(83)
Total gains	432.7304	449.3773	460.3263	469.2503	470.9654	452.5263	430.9484	417.9569	405.5431	399.6924	405.5849	417.3863	(84)

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7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.1568	59.3243	59.4894	60.2773	60.4271	61.1340	61.1340	61.2668	60.8598	60.4271	60.1249	59.8122	
alpha	4.9438	4.9550	4.9660	5.0185	5.0285	5.0756	5.0756	5.0845	5.0573	5.0285	5.0083	4.9875	
util living area													
	0.9992	0.9988	0.9979	0.9948	0.9836	0.9402	0.8392	0.8679	0.9700	0.9950	0.9986	0.9993	(86)
MIT	19.6314	19.7192	19.9095	20.1949	20.4961	20.7758	20.9207	20.9015	20.6846	20.3066	19.9303	19.6210	(87)
Th 2	19.9409	19.9436	19.9462	19.9585	19.9608	19.9716	19.9716	19.9736	19.9674	19.9608	19.9562	19.9513	(88)
util rest of house													
	0.9989	0.9984	0.9970	0.9922	0.9736	0.8944	0.7132	0.7573	0.9453	0.9920	0.9979	0.9991	(89)
MIT 2	18.1065	18.2369	18.5171	18.9424	19.3797	19.7715	19.9305	19.9165	19.6519	19.1077	18.5547	18.0986	(90)
Living area fraction									fLA = Living area / (4) =			0.3372	(91)
MIT	18.6207	18.7367	18.9866	19.3647	19.7561	20.1101	20.2644	20.2486	20.0001	19.5119	19.0185	18.6119	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6207	18.7367	18.9866	19.3647	19.7561	20.1101	20.2644	20.2486	20.0001	19.5119	19.0185	18.6119	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9983	0.9976	0.9958	0.9902	0.9709	0.9023	0.7554	0.7930	0.9463	0.9901	0.9971	0.9986	(94)
Useful gains	431.9908	448.3144	458.4107	464.6396	457.2740	408.2987	325.5364	331.4330	383.7729	395.7524	404.4002	416.8006	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1462.9026	1409.4691	1268.4121	1049.1313	805.6589	544.6737	362.2193	379.6119	585.8510	891.2448	1197.9090	1456.0904	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	766.9984	645.8960	602.6411	420.8340	259.1984	0.0000	0.0000	0.0000	0.0000	368.6463	571.3263	773.2316	(98)
Space heating												4408.7720	(98)
Space heating per m2											(98) / (4) =	50.6639	(99)

8c. Space cooling requirement

Not applicable

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

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.4000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												4720.3126	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	766.9984	645.8960	602.6411	420.8340	259.1984	0.0000	0.0000	0.0000	0.0000	368.6463	571.3263	773.2316	(98)
Space heating efficiency (main heating system 1)													
	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)													
	821.1974	691.5374	645.2260	450.5718	277.5143	0.0000	0.0000	0.0000	0.0000	394.6963	611.6984	827.8710	(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													
	206.8086	182.3346	190.3161	168.8008	163.4290	143.9391	137.9046	153.7314	155.4292	176.9871	188.3032	201.8911	(64)
Efficiency of water heater												80.3000	(216)
(217)m	88.0481	87.9643	87.7510	87.2580	86.2070	80.3000	80.3000	80.3000	80.3000	86.8564	87.6666	88.1056	(217)
Fuel for water heating, kWh/month													
	234.8815	207.2826	216.8820	193.4502	189.5773	179.2517	171.7368	191.4463	193.5606	203.7698	214.7946	229.1467	(219)
Water heating fuel used												2425.7801	(219)
Annual totals kWh/year													
Space heating fuel - main system												4720.3126	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												478.3088	(232)
Total delivered energy for all uses												7699.4015	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4720.3126	0.2160	1019.5875	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2425.7801	0.2160	523.9685	(264)
Space and water heating			1543.5560	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	478.3088	0.5190	248.2423	(268)
Total CO2, kg/m2/year			1830.7233	(272)
Emissions per m2 for space and water heating			17.7379	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.8527	(272b)
Emissions per m2 for pumps and fans			0.4473	(272c)
Target Carbon Dioxide Emission Rate (TER) = (17.7379 * 1.00) + 2.8527 + 0.4473, rounded to 2 d.p.			21.0400	(273)

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

Property Reference	Flat 07 - 1 Hamsphire St.	**Issued on Date**	11/05/2020
Assessment Reference	AD - Gas Combi + PV	**Prop Type Ref**	
Property	Flat 7, 1 Hampshire Street, London, NW5 2TE		

SAP Rating	89 B	**DER**	12.04	**TER**	19.44
Environmental	92 A	**% DER<TER**	38.06		
CO_2 Emissions (t/year)	0.57	**DFEE**	42.28	**TFEE**	48.72
General Requirements Compliance	Pass	**% DFEE<TFEE**	13.23		

Assessor Details	Mr. Andrew Gwynne, Andrew Gwynne, Tel: 01636 653055, andrew.gwynne@mesenergyservices.co.uk	**Assessor ID**	P741-0001
Client			

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

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

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

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DWELLING AS DESIGNED

Mid-floor flat, total floor area 66 m²

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

1a TER and DER
Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 19.44 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.04 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)48.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)42.3 kWh/m²/yrOK

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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	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.33 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated using user-specified y-value of 0.118

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3 Air permeability
Air permeability at 50 pascals: 5.00 (design value)
Maximum 10.0 OK

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4 Heating efficiency
Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
tbc tbc
Combi boiler
Efficiency: 89.0% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

---

5 Cylinder insulation
Hot water storage No cylinder

---

6 Controls
Space heating controls: Time and temperature zone control OK

Hot water controls: No cylinder

Boiler interlock Yes OK

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

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8 Mechanical ventilation
Not applicable

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9 Summertime temperature
Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing North: 1.56 m², No overhang
Windows facing East: 2.40 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

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10 Key features
Party wall U-value 0.00 W/m²K
Roof U-value 0.11 W/m²K
Door U-value 1.00 W/m²K
Photovoltaic array 1.00 kW

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	66.2700 (1b)	x	2.4000 (2b)	=	159.0480	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.2700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	159.0480	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1257	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3757	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3194	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4072	0.3992	0.3912	0.3513	0.3433	0.3034	0.3034	0.2954	0.3194	0.3433	0.3593	0.3753	(22b)
Effective ac	0.5829	0.5797	0.5765	0.5617	0.5589	0.5460	0.5460	0.5436	0.5510	0.5589	0.5646	0.5704	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 1.40)			3.9600	1.3258	5.2500			(27)
Ext Door			2.3300	1.0000	2.3300			(26)
Glazed Door			7.2000	1.4000	10.0800			(26a)
External Wall 1	73.7800	13.4900	60.2900	0.1800	10.8522	0.0000	0.0000	(29a)
Flat Roof - To Terrace	3.3400		3.3400	0.1100	0.3674	9.0000	30.0600	(30)
Total net area of external elements Aum(A, m2)			77.1200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.8796			(33)
Party Wall 1			30.6300	0.0000	0.0000	0.0000	0.0000	(32)
Party Floor 1			66.2700			0.0000	0.0000	(32d)
Party Ceilings 1			62.9300			0.0000	0.0000	(32b)
Stud Wall			108.6700			75.0000	8150.2500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8180.3100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		123.4391 (35)
Thermal bridges (User defined value 0.118 * total exposed area)		9.1002 (36)
Total fabric heat loss	(33) + (36) =	37.9798 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	30.5947	30.4257	30.2601	29.4821	29.3365	28.6589	28.6589	28.5334	28.9199	29.3365	29.6310	29.9388	(38)
Heat transfer coeff	68.5744	68.4054	68.2398	67.4618	67.3163	66.6386	66.6386	66.5132	66.8997	67.3163	67.6107	67.9186	(39)
Average = Sum(39)m / 12 =												67.4611	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0348	1.0322	1.0297	1.0180	1.0158	1.0056	1.0056	1.0037	1.0095	1.0158	1.0202	1.0249	(40)
HLP (average)												1.0180	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.1523 (42)
Average daily hot water use (litres/day)		85.3167 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	93.8484	90.4357	87.0230	83.6104	80.1977	76.7850	76.7850	80.1977	83.6104	87.0230	90.4357	93.8484	(44)
Energy conte	139.1744	121.7228	125.6071	109.5073	105.0748	90.6716	84.0206	96.4148	97.5663	113.7041	124.1170	134.7830	(45)
Energy content (annual)										Total = Sum(45)m =		1342.3638	(45)
Distribution loss (46)m = 0.15 x (45)m	20.8762	18.2584	18.8411	16.4261	15.7612	13.6007	12.6031	14.4622	14.6349	17.0556	18.6175	20.2174	(46)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Water storage loss:
Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	47.8241	41.6252	44.3460	41.2325	40.8679	37.8666	39.1288	40.8679	41.2325	44.3460	44.5984	47.8241 (61)

Total heat required for water heating calculated for each month

	186.9985	163.3480	169.9530	150.7398	145.9427	128.5382	123.1494	137.2827	138.7988	158.0501	168.7154	182.6071 (62)
WWHRS	-29.1000	-25.6015	-26.1312	-21.5187	-19.9902	-16.4978	-13.9750	-16.9164	-17.4043	-21.5017	-24.8884	-28.1223 eq.(G10)

Total of WWHRS savings -261.6476

Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)

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

Output from w/h

	157.8985	137.7465	143.8218	129.2211	125.9525	112.0404	109.1743	120.3663	121.3946	136.5484	143.8269	154.4848 (64)

Total per year (kWh/year) = Sum(64)m = 1592.4762 (64)

Heat gains from water heating, kWh/month

	58.2315	50.8791	52.8508	46.7193	45.1544	39.6150	37.7190	42.2749	42.7489	48.8931	52.4185	56.7714 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	107.6141	107.6141	107.6141	107.6141	107.6141	107.6141	107.6141	107.6141	107.6141	107.6141	107.6141	107.6141	(66)

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

	21.2995	18.9180	15.3852	11.6476	8.7067	7.3506	7.9425	10.3240	13.8569	17.5945	20.5354	21.8915	(67)

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

	188.4399	190.3954	185.4678	174.9775	161.7355	149.2898	140.9753	139.0199	143.9475	154.4377	167.6798	180.1255	(68)

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

	33.7614	33.7614	33.7614	33.7614	33.7614	33.7614	33.7614	33.7614	33.7614	33.7614	33.7614	33.7614	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-86.0913	-86.0913	-86.0913	-86.0913	-86.0913	-86.0913	-86.0913	-86.0913	-86.0913	-86.0913	-86.0913	-86.0913	(71)

Water heating gains (Table 5)

	78.2682	75.7130	71.0361	64.8879	60.6913	55.0208	50.6976	56.8211	59.3735	65.7166	72.8035	76.3056	(72)

Total internal gains

	346.2919	343.3106	330.1733	309.7972	289.4177	269.9454	257.8997	264.4493	275.4621	296.0330	319.3029	336.6068	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.5600	10.6334	0.7600	0.7000	0.7700	6.1156	(74)
East	2.4000	19.6403	0.7600	0.7000	0.7700	17.3781	(76)

Solar gains	23.4938	45.6826	75.8450	113.5510	143.0386	148.4387	140.4727	117.8459	88.9910	54.2505	29.2129	19.3892	(83)
Total gains	369.7856	388.9933	406.0183	423.3483	432.4563	418.3841	398.3724	382.2952	364.4532	350.2835	348.5158	355.9960	(84)

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7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	33.1364	33.2182	33.2989	33.6829	33.7557	34.0990	34.0990	34.1633	33.9659	33.7557	33.6087	33.4564	
alpha	3.2091	3.2145	3.2199	3.2455	3.2504	3.2733	3.2733	3.2776	3.2644	3.2504	3.2406	3.2304	
util living area													
	0.9818	0.9769	0.9657	0.9391	0.8828	0.7733	0.6384	0.6750	0.8467	0.9444	0.9743	0.9839	(86)
MIT	19.4798	19.5906	19.8176	20.1440	20.4658	20.7268	20.8456	20.8289	20.6342	20.2349	19.8096	19.4600	(87)
Th 2	20.0545	20.0566	20.0586	20.0684	20.0702	20.0787	20.0787	20.0803	20.0754	20.0702	20.0665	20.0627	(88)
util rest of house													
	0.9787	0.9728	0.9592	0.9261	0.8543	0.7114	0.5360	0.5776	0.7996	0.9302	0.9691	0.9811	(89)
MIT 2	17.9992	18.1617	18.4927	18.9697	19.4239	19.7750	19.9085	19.8947	19.6608	19.1055	18.4885	17.9761	(90)
Living area fraction										fLA = Living area / (4) =		0.3831	(91)
MIT	18.5665	18.7091	19.0003	19.4196	19.8231	20.1397	20.2675	20.2526	20.0337	19.5382	18.9947	18.5446	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.4165	18.5591	18.8503	19.2696	19.6731	19.9897	20.1175	20.1026	19.8837	19.3882	18.8447	18.3946	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9713	0.9642	0.9483	0.9122	0.8397	0.7046	0.5408	0.5802	0.7879	0.9168	0.9599	0.9744	(94)
Useful gains	359.1841	375.0714	385.0189	386.1952	363.1511	294.7744	215.4335	221.8102	287.1404	321.1284	334.5281	346.8746	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	968.0282	934.3578	842.7837	699.5527	536.7167	359.1607	234.4034	246.2722	386.9291	591.5891	794.0658	964.0778	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	452.9800	375.8405	340.5770	225.6174	129.1328	0.0000	0.0000	0.0000	0.0000	201.2228	330.8672	459.1992	(98)
Space heating												2515.4368	(98)
Space heating per m2											(98) / (4) =	37.9574	(99)

8c. Space cooling requirement

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	89.9000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	2798.0388	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	452.9800	375.8405	340.5770	225.6174	129.1328	0.0000	0.0000	0.0000	0.0000	201.2228	330.8672	459.1992	(98)
Space heating efficiency (main heating system 1)													
	89.9000	89.9000	89.9000	89.9000	89.9000	0.0000	0.0000	0.0000	0.0000	89.9000	89.9000	89.9000	(210)
Space heating fuel (main heating system)													
	503.8710	418.0651	378.8398	250.9649	143.6405	0.0000	0.0000	0.0000	0.0000	223.8296	368.0391	510.7889	(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													
	157.8985	137.7465	143.8218	129.2211	125.9525	112.0404	109.1743	120.3663	121.3946	136.5484	143.8269	154.4848	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.0521	86.9485	86.6440	85.9389	84.6122	79.8000	79.8000	79.8000	79.8000	85.5241	86.5798	87.1241	(217)
Fuel for water heating, kWh/month													
	181.3839	158.4231	165.9916	150.3638	148.8585	140.4015	136.8100	150.8350	152.1235	159.6608	166.1206	177.3157	(219)
Water heating fuel used												1888.2880	(219)
Annual totals kWh/year													
Space heating fuel - main system												2798.0388	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												376.1562	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.00 * 1080 * 1.00) =										-863.6197		-863.6197	(233)
Total delivered energy for all uses												4273.8633	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2798.0388	0.2160	604.3764	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1888.2880	0.2160	407.8702	(264)
Space and water heating			1012.2466	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	376.1562	0.5190	195.2251	(268)
Energy saving/generation technologies				
PV Unit	-863.6197	0.5190	-448.2186	(269)
Total CO2, kg/year			798.1780	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			12.0400	(273)

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

DER		12.0400	ZC1
Total Floor Area	TFA	66.2700	
Assumed number of occupants	N	2.1523	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.8501	ZC2
CO2 emissions from cooking, equation (L16)		2.5751	ZC3
Total CO2 emissions		31.4652	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		31.4652	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	66.2700 (1b)	x	2.4000 (2b)	=	159.0480	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.2700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	159.0480	(5)

2. Ventilation rate

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000	/ (5) =	0.1257	(8)
Pressure test			Yes	
Measured/design AP50			5.0000	
Infiltration rate			0.3757	(18)
Number of sides sheltered			2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.3194	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4072	0.3992	0.3912	0.3513	0.3433	0.3034	0.3034	0.2954	0.3194	0.3433	0.3593	0.3753	(22b)
Effective ac	0.5829	0.5797	0.5765	0.5617	0.5589	0.5460	0.5460	0.5436	0.5510	0.5589	0.5646	0.5704	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.3300	1.0000	2.3300			(26)
TER Semi-glazed door			7.2000	1.2000	8.6400			(26a)
TER Opening Type (Uw = 1.40)			3.9600	1.3258	5.2500			(27)
External Wall 1	73.7800	13.4900	60.2900	0.1800	10.8522			(29a)
Flat Roof - To Terrace	3.3400		3.3400	0.1300	0.4342			(30)
Total net area of external elements Aum(A, m2)			77.1200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.5064			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.8202	(36)
Total fabric heat loss						(33) + (36) =	35.3266	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	30.5947	30.4257	30.2601	29.4821	29.3365	28.6589	28.6589	28.5334	28.9199	29.3365	29.6310	29.9388	(38)
Heat transfer coeff	65.9213	65.7523	65.5867	64.8087	64.6631	63.9855	63.9855	63.8600	64.2465	64.6631	64.9576	65.2654	(39)
Average = Sum(39)m / 12 =												64.8080	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9947	0.9922	0.9897	0.9779	0.9758	0.9655	0.9655	0.9636	0.9695	0.9758	0.9802	0.9848	(40)
HLP (average)												0.9779	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1523	(42)
Average daily hot water use (litres/day)												85.3167	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	93.8484	90.4357	87.0230	83.6104	80.1977	76.7850	76.7850	80.1977	83.6104	87.0230	90.4357	93.8484	(44)
Energy conte	139.1744	121.7228	125.6071	109.5073	105.0748	90.6716	84.0206	96.4148	97.5663	113.7041	124.1170	134.7830	(45)
Energy content (annual)										Total = Sum(45)m =		1342.3638	(45)
Distribution loss (46)m = 0.15 x (45)m	20.8762	18.2584	18.8411	16.4261	15.7612	13.6007	12.6031	14.4622	14.6349	17.0556	18.6175	20.2174	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	47.8241	41.6252	44.3460	41.2325	40.8679	37.8666	39.1288	40.8679	41.2325	44.3460	44.5984	47.8241	(61)
Total heat required for water heating calculated for each month													
	186.9985	163.3480	169.9530	150.7398	145.9427	128.5382	123.1494	137.2827	138.7988	158.0501	168.7154	182.6071	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h													
	186.9985	163.3480	169.9530	150.7398	145.9427	128.5382	123.1494	137.2827	138.7988	158.0501	168.7154	182.6071	(64)
									Total per year (kWh/year) = Sum(64)m =			1854.1238	(64)
Heat gains from water heating, kWh/month													
	58.2315	50.8791	52.8508	46.7193	45.1544	39.6150	37.7190	42.2749	42.7489	48.8931	52.4185	56.7714	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	107.6141	107.6141	107.6141	107.6141	107.6141	107.6141	107.6141	107.6141	107.6141	107.6141	107.6141	107.6141	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	21.2995	18.9180	15.3852	11.6476	8.7067	7.3506	7.9425	10.3240	13.8569	17.5945	20.5354	21.8915	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	188.4399	190.3954	185.4678	174.9775	161.7355	149.2898	140.9753	139.0199	143.9475	154.4377	167.6798	180.1255	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.7614	33.7614	33.7614	33.7614	33.7614	33.7614	33.7614	33.7614	33.7614	33.7614	33.7614	33.7614	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-86.0913	-86.0913	-86.0913	-86.0913	-86.0913	-86.0913	-86.0913	-86.0913	-86.0913	-86.0913	-86.0913	-86.0913	(71)
Water heating gains (Table 5)													
	78.2682	75.7130	71.0361	64.8879	60.6913	55.0208	50.6976	56.8211	59.3735	65.7166	72.8035	76.3056	(72)
Total internal gains													
	346.2919	343.3106	330.1733	309.7972	289.4177	269.9454	257.8997	264.4493	275.4621	296.0330	319.3029	336.6068	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.5600	10.6334	0.6300	0.7000	0.7700	5.0695	(74)
East	2.4000	19.6403	0.6300	0.7000	0.7700	14.4056	(76)

Solar gains	19.4751	37.8685	62.8715	94.1278	118.5714	123.0479	116.4444	97.6881	73.7689	44.9708	24.2160	16.0727	(83)
Total gains	365.7670	381.1791	393.0448	403.9251	407.9892	392.9932	374.3442	362.1373	349.2310	341.0039	343.5188	352.6795	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.8118	69.9912	70.1680	71.0103	71.1702	71.9239	71.9239	72.0652	71.6317	71.1702	70.8475	70.5134	
alpha	5.6541	5.6661	5.6779	5.7340	5.7447	5.7949	5.7949	5.8043	5.7754	5.7447	5.7232	5.7009	
util living area													
	0.9987	0.9980	0.9961	0.9891	0.9627	0.8698	0.7103	0.7513	0.9332	0.9899	0.9975	0.9989	(86)
MIT	19.9272	20.0105	20.1833	20.4372	20.6947	20.9007	20.9771	20.9682	20.8280	20.5098	20.1807	19.9127	(87)
Th 2	20.0877	20.0898	20.0919	20.1017	20.1036	20.1122	20.1122	20.1137	20.1089	20.1036	20.0999	20.0960	(88)
util rest of house													
	0.9982	0.9974	0.9946	0.9843	0.9438	0.8030	0.5875	0.6344	0.8915	0.9846	0.9965	0.9986	(89)
MIT 2	18.6445	18.7679	19.0218	19.3981	19.7642	20.0324	20.1018	20.0978	19.9486	19.5060	19.0244	18.6295	(90)
Living area fraction									fLA = Living area / (4) =			0.3831	(91)
MIT	19.1360	19.2439	19.4668	19.7962	20.1207	20.3651	20.4371	20.4313	20.2855	19.8906	19.4674	19.1211	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1360	19.2439	19.4668	19.7962	20.1207	20.3651	20.4371	20.4313	20.2855	19.8906	19.4674	19.1211	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9976	0.9965	0.9932	0.9822	0.9443	0.8245	0.6351	0.6794	0.9015	0.9829	0.9956	0.9980	(94)
Useful gains	364.8853	379.8364	390.3880	396.7331	385.2595	324.0332	237.7457	246.0508	314.8224	335.1773	341.9931	351.9910	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	978.0058	943.1466	850.4477	706.1688	544.5076	368.8836	245.5214	257.4364	397.3957	600.7570	803.3573	973.8328	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	456.1617	378.5444	342.2844	222.7937	118.4806	0.0000	0.0000	0.0000	0.0000	197.5913	332.1822	462.6503	(98)
Space heating												2510.6887	(98)
Space heating per m2											(98) / (4) =	37.8858	(99)

8c. Space cooling requirement

Not applicable

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

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.4000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2688.1035	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	456.1617	378.5444	342.2844	222.7937	118.4806	0.0000	0.0000	0.0000	0.0000	197.5913	332.1822	462.6503	(98)
Space heating efficiency (main heating system 1)													
	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)													
	488.3958	405.2938	366.4715	238.5371	126.8529	0.0000	0.0000	0.0000	0.0000	211.5539	355.6555	495.3430	(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													
	186.9985	163.3480	169.9530	150.7398	145.9427	128.5382	123.1494	137.2827	138.7988	158.0501	168.7154	182.6071	(64)
Efficiency of water heater												80.3000	(216)
(217)m	87.2107	87.0977	86.7786	86.0331	84.5318	80.3000	80.3000	80.3000	80.3000	85.6144	86.7258	87.2928	(217)
Fuel for water heating, kWh/month													
	214.4215	187.5457	195.8467	175.2113	172.6484	160.0725	153.3616	170.9623	172.8504	184.6069	194.5388	209.1892	(219)
Water heating fuel used												2191.2552	(219)
Annual totals kWh/year													
Space heating fuel - main system												2688.1035	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												376.1562	(232)
Total delivered energy for all uses												5330.5149	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2688.1035	0.2160	580.6304	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2191.2552	0.2160	473.3111	(264)
Space and water heating			1053.9415	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	376.1562	0.5190	195.2251	(268)
Total CO2, kg/m2/year			1288.0915	(272)
Emissions per m2 for space and water heating			15.9037	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.9459	(272b)
Emissions per m2 for pumps and fans			0.5874	(272c)
Target Carbon Dioxide Emission Rate (TER) = (15.9037 * 1.00) + 2.9459 + 0.5874, rounded to 2 d.p.			19.4400	(273)

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

Property Reference	Flat 08 - 1 Hampshire St.	**Issued on Date**	11/05/2020
Assessment Reference	AD - Gas Combi + PV	**Prop Type Ref**	
Property	Flat 8, 1 Hampshire Street, London, NW5 2TE		

SAP Rating	89 B	**DER**	11.83	**TER**	19.68
Environmental	92 A	**% DER<TER**	39.88		
CO_2 Emissions (t/year)	0.50	**DFEE**	41.73	**TFEE**	46.93
General Requirements Compliance	Pass	**% DFEE<TFEE**	11.07		

Assessor Details	Mr. Andrew Gwynne, Andrew Gwynne, Tel: 01636 653055, andrew.gwynne@mesenergyservices.co.uk	**Assessor ID**	P741-0001
Client			

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

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

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

Mid-floor flat, total floor area 61 m²

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

1a TER and DER
Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 19.68 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 11.83 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)46.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)41.7 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	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.34 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated using user-specified y-value of 0.172

---
3 Air permeability
Air permeability at 50 pascals: 5.00 (design value)
Maximum 10.0 OK

---
4 Heating efficiency
Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
tbc tbc
Combi boiler
Efficiency: 89.0% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage No cylinder

---
6 Controls
Space heating controls: Time and temperature zone control OK

Hot water controls: No cylinder

Boiler interlock Yes OK

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

---
8 Mechanical ventilation
Not applicable

---
9 Summertime temperature
Overheating risk (Thames Valley): Not significant OK
Based on:
Overshading: Average
Windows facing North: 2.57 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Roof U-value 0.11 W/m²K
Door U-value 1.00 W/m²K
Photovoltaic array 1.00 kW

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	60.6300 (1b)	x	2.4000 (2b)	=	145.5120	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.6300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	145.5120	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1374	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3874	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3293	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4199	0.4117	0.4034	0.3623	0.3540	0.3129	0.3129	0.3046	0.3293	0.3540	0.3705	0.3870	(22b)
Effective ac	0.5882	0.5847	0.5814	0.5656	0.5627	0.5489	0.5489	0.5464	0.5542	0.5627	0.5686	0.5749	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 1.40)			2.5700	1.3258	3.4072			(27)
Ext Door			2.3300	1.0000	2.3300			(26)
Glazed Door			10.4400	1.4000	14.6160			(26a)
External Wall 1	38.9300	15.3400	23.5900	0.1800	4.2462	0.0000	0.0000	(29a)
Flat Roof to Terrace	5.4000		5.4000	0.1100	0.5940	9.0000	48.6000	(30)
Total net area of external elements Aum(A, m2)			44.3300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.1934			(33)
Party Wall 1			48.5000	0.0000	0.0000	0.0000	0.0000	(32)
Party Floor 1			60.6300			0.0000	0.0000	(32d)
Party Ceilings 1			55.2300			0.0000	0.0000	(32b)
Stud Wall			97.6300			75.0000	7322.2500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7370.8500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		121.5710 (35)
Thermal bridges (User defined value 0.172 * total exposed area)		7.6248 (36)
Total fabric heat loss	(33) + (36) =	32.8182 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.2426	28.0782	27.9171	27.1603	27.0187	26.3596	26.3596	26.2375	26.6135	27.0187	27.3052	27.6046	(38)
Heat transfer coeff	61.0608	60.8964	60.7353	59.9785	59.8369	59.1778	59.1778	59.0557	59.4316	59.8369	60.1233	60.4228	(39)
Average = Sum(39)m / 12 =												59.9778	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0071	1.0044	1.0017	0.9893	0.9869	0.9760	0.9760	0.9740	0.9802	0.9869	0.9916	0.9966	(40)
HLP (average)												0.9892	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.9994 (42)
Average daily hot water use (litres/day)	81.6855 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	89.8541	86.5866	83.3192	80.0518	76.7844	73.5170	73.5170	76.7844	80.0518	83.3192	86.5866	89.8541	(44)
Energy conte	133.2510	116.5422	120.2611	104.8465	100.6027	86.8125	80.4445	92.3113	93.4138	108.8648	118.8344	129.0465	(45)
Energy content (annual)										Total = Sum(45)m =		1285.2312	(45)
Distribution loss (46)m = 0.15 x (45)m	19.9876	17.4813	18.0392	15.7270	15.0904	13.0219	12.0667	13.8467	14.0121	16.3297	17.8252	19.3570	(46)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Water storage loss:
Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	45.7886	39.8536	42.4586	39.4776	39.1285	36.2549	37.4634	39.1285	39.4776	42.4586	42.7003	45.7886 (61)

Total heat required for water heating calculated for each month

	179.0396	156.3957	162.7196	144.3241	139.7312	123.0674	117.9080	131.4398	132.8914	151.3233	161.5347	174.8351 (62)
WWHRS	-27.3776	-24.0852	-24.5840	-20.2512	-18.8162	-15.5313	-13.1606	-15.9291	-16.3866	-20.2397	-23.4212	-26.4563 eq.(G10)

Total of WWHRS savings -246.2389

Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)

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

Output from w/h

	151.6621	132.3106	138.1356	124.0729	120.9150	107.5362	104.7473	115.5107	116.5048	131.0836	138.1134	148.3788 (64)

Total per year (kWh/year) = Sum(64)m = 1528.9711 (64)

Heat gains from water heating, kWh/month

	55.7531	48.7137	50.6014	44.7309	43.2325	37.9289	36.1137	40.4756	40.9295	46.8122	50.1875	54.3551 (65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	(66)

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

	20.6354	18.3282	14.9055	11.2844	8.4352	7.1214	7.6949	10.0021	13.4248	17.0459	19.8951	21.2089 (67)

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

	174.5330	176.3441	171.7801	162.0641	149.7993	138.2721	130.5713	128.7602	133.3241	143.0402	155.3049	166.8321 (68)

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

	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756 (71)

Water heating gains (Table 5)

	74.9370	72.4906	68.0127	62.1262	58.1082	52.6790	48.5399	54.4027	56.8465	62.9196	69.7049	73.0579 (72)

Total internal gains

	326.0962	323.1537	310.6892	291.4656	272.3336	254.0634	242.7969	249.1559	259.5863	278.9965	300.8958	317.0899 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.5700	10.6334	0.7600	0.7000	0.7700	10.0751	(74)

Solar gains	10.0751	19.2541	32.7173	52.5524	70.7929	75.7859	70.7559	56.1358	39.3368	22.9194	12.4289	8.3991 (83)
Total gains	336.1713	342.4078	343.4065	344.0180	343.1266	329.8493	313.5528	305.2916	298.9231	301.9159	313.3247	325.4890 (84)

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7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	33.5315	33.6220	33.7112	34.1365	34.2173	34.5984	34.5984	34.6700	34.4506	34.2173	34.0543	33.8855	
alpha	3.2354	3.2415	3.2474	3.2758	3.2812	3.3066	3.3066	3.3113	3.2967	3.2812	3.2703	3.2590	
util living area	0.9813	0.9782	0.9708	0.9524	0.9102	0.8178	0.6921	0.7214	0.8713	0.9498	0.9743	0.9832	(86)
MIT	19.5055	19.5952	19.7954	20.0986	20.4151	20.6933	20.8289	20.8123	20.6095	20.2269	19.8270	19.4905	(87)
Th 2	20.0774	20.0797	20.0819	20.0923	20.0942	20.1033	20.1033	20.1050	20.0998	20.0942	20.0903	20.0862	(88)
util rest of house	0.9782	0.9744	0.9653	0.9421	0.8872	0.7629	0.5926	0.6283	0.8299	0.9369	0.9692	0.9803	(89)
MIT 2	18.0540	18.1863	18.4793	18.9255	19.3772	19.7599	19.9188	19.9040	19.6521	19.1137	18.5321	18.0385	(90)
Living area fraction									fLA = Living area / (4) =			0.3663	(91)
MIT	18.5857	18.7024	18.9614	19.3552	19.7574	20.1018	20.2522	20.2367	20.0028	19.5215	19.0065	18.5704	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.4357	18.5524	18.8114	19.2052	19.6074	19.9518	20.1022	20.0867	19.8528	19.3715	18.8565	18.4204	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9706	0.9660	0.9551	0.9292	0.8719	0.7519	0.5925	0.6261	0.8159	0.9236	0.9598	0.9733	(94)
Useful gains	326.2774	330.7816	328.0037	319.6513	299.1618	248.0301	185.7688	191.1458	243.8960	278.8596	300.7403	316.8025	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	863.1386	831.3822	747.7377	618.0912	473.1526	316.7061	207.2525	217.7232	341.8986	524.8572	706.8374	859.2335	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	399.4247	336.4036	312.2821	214.8767	129.4491	0.0000	0.0000	0.0000	0.0000	183.0222	292.3899	403.5686	(98)

Space heating 2271.4169 (98)

Space heating per m2 (98) / (4) = 37.4636 (99)

8c. Space cooling requirement

Not applicable

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.9000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2526.6039	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	399.4247	336.4036	312.2821	214.8767	129.4491	0.0000	0.0000	0.0000	0.0000	183.0222	292.3899	403.5686	(98)
Space heating efficiency (main heating system 1)													
	89.9000	89.9000	89.9000	89.9000	89.9000	0.0000	0.0000	0.0000	0.0000	89.9000	89.9000	89.9000	(210)
Space heating fuel (main heating system)													
	444.2989	374.1976	347.3661	239.0174	143.9923	0.0000	0.0000	0.0000	0.0000	203.5842	325.2390	448.9084	(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													
	151.6621	132.3106	138.1356	124.0729	120.9150	107.5362	104.7473	115.5107	116.5048	131.0836	138.1134	148.3788	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.8740	86.7989	86.5408	85.9194	84.7213	79.8000	79.8000	79.8000	79.8000	85.3898	86.3921	86.9418	(217)
Fuel for water heating, kWh/month													
	174.5770	152.4335	159.6190	144.4062	142.7209	134.7571	131.2623	144.7502	145.9960	153.5120	159.8682	170.6645	(219)
Water heating fuel used												1814.5670	(219)
Annual totals kWh/year													
Space heating fuel - main system												2526.6039	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												364.4281	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.00 * 1080 * 1.00) =										-863.6197		-863.6197	(233)
Total delivered energy for all uses												3916.9793	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2526.6039	0.2160	545.7464	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1814.5670	0.2160	391.9465	(264)
Space and water heating			937.6929	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	364.4281	0.5190	189.1382	(268)
Energy saving/generation technologies				
PV Unit	-863.6197	0.5190	-448.2186	(269)
Total CO2, kg/year			717.5375	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			11.8300	(273)

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

DER		11.8300	ZC1
Total Floor Area	TFA	60.6300	
Assumed number of occupants	N	1.9994	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.0583	ZC2
CO2 emissions from cooking, equation (L16)		2.7542	ZC3
Total CO2 emissions		31.6425	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		31.6425	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	60.6300 (1b)	x	2.4000 (2b)	=	145.5120	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.6300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	145.5120	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1374	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3874	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3293	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4199	0.4117	0.4034	0.3623	0.3540	0.3129	0.3129	0.3046	0.3293	0.3540	0.3705	0.3870	(22b)
Effective ac	0.5882	0.5847	0.5814	0.5656	0.5627	0.5489	0.5489	0.5464	0.5542	0.5627	0.5686	0.5749	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.3300	1.0000	2.3300			(26)
TER Semi-glazed door			10.4400	1.2000	12.5280			(26a)
TER Opening Type (Uw = 1.40)			2.3900	1.3258	3.1686			(27)
External Wall 1	38.9300	15.1600	23.7700	0.1800	4.2786			(29a)
Flat Roof to Terrace	5.4000		5.4000	0.1300	0.7020			(30)
Total net area of external elements Aum(A, m2)			44.3300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0072			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.3634	(36)
Total fabric heat loss					(33) + (36) =		29.3706	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.2426	28.0782	27.9171	27.1603	27.0187	26.3596	26.3596	26.2375	26.6135	27.0187	27.3052	27.6046	(38)
Heat transfer coeff	57.6132	57.4488	57.2877	56.5309	56.3893	55.7302	55.7302	55.6081	55.9840	56.3893	56.6757	56.9752	(39)
Average = Sum(39)m / 12 =												56.5302	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9502	0.9475	0.9449	0.9324	0.9301	0.9192	0.9192	0.9172	0.9234	0.9301	0.9348	0.9397	(40)
HLP (average)												0.9324	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.9994 (42)
Average daily hot water use (litres/day)		81.6855 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	89.8541	86.5866	83.3192	80.0518	76.7844	73.5170	73.5170	76.7844	80.0518	83.3192	86.5866	89.8541	(44)
Energy conte	133.2510	116.5422	120.2611	104.8465	100.6027	86.8125	80.4445	92.3113	93.4138	108.8648	118.8344	129.0465	(45)
Energy content (annual)										Total = Sum(45)m =		1285.2312	(45)
Distribution loss (46)m = 0.15 x (45)m	19.9876	17.4813	18.0392	15.7270	15.0904	13.0219	12.0667	13.8467	14.0121	16.3297	17.8252	19.3570	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	45.7886	39.8536	42.4586	39.4776	39.1285	36.2549	37.4634	39.1285	39.4776	42.4586	42.7003	45.7886	(61)
Total heat required for water heating calculated for each month													
	179.0396	156.3957	162.7196	144.3241	139.7312	123.0674	117.9080	131.4398	132.8914	151.3233	161.5347	174.8351	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000	(63)
Output from w/h													
	179.0396	156.3957	162.7196	144.3241	139.7312	123.0674	117.9080	131.4398	132.8914	151.3233	161.5347	174.8351	(64)
Total per year (kWh/year) = Sum(64)m =												1775.2100	(64)
Heat gains from water heating, kWh/month													
	55.7531	48.7137	50.6014	44.7309	43.2325	37.9289	36.1137	40.4756	40.9295	46.8122	50.1875	54.3551	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	99.9695	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	20.7996	18.4740	15.0240	11.3742	8.5023	7.1780	7.7561	10.0817	13.5316	17.1815	20.0533	21.3776	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	174.5330	176.3441	171.7801	162.0641	149.7993	138.2721	130.5713	128.7602	133.3241	143.0402	155.3049	166.8321	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	32.9970	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	-79.9756	(71)
Water heating gains (Table 5)													
	74.9370	72.4906	68.0127	62.1262	58.1082	52.6790	48.5399	54.4027	56.8465	62.9196	69.7049	73.0579	(72)
Total internal gains													
	326.2604	323.2995	310.8077	291.5553	272.4007	254.1200	242.8581	249.2354	259.6931	279.1321	301.0540	317.2585	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.3900	10.6334	0.6300	0.7000	0.7700	7.7668	(74)

Solar gains	7.7668	14.8427	25.2214	40.5121	54.5735	58.4225	54.5449	43.2744	30.3243	17.6683	9.5813	6.4748	(83)
Total gains	334.0271	338.1422	336.0292	332.0674	326.9742	312.5426	297.4030	292.5098	290.0174	296.8004	310.6353	323.7333	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.0808	73.2899	73.4960	74.4799	74.6669	75.5501	75.5501	75.7159	75.2074	74.6669	74.2896	73.8991	
alpha	5.8721	5.8860	5.8997	5.9653	5.9778	6.0367	6.0367	6.0477	6.0138	5.9778	5.9526	5.9266	
util living area	0.9987	0.9983	0.9971	0.9930	0.9768	0.9079	0.7637	0.7947	0.9487	0.9915	0.9976	0.9989	(86)
MIT	19.9896	20.0553	20.2025	20.4286	20.6691	20.8821	20.9708	20.9623	20.8204	20.5285	20.2295	19.9791	(87)
Th 2	20.1250	20.1273	20.1295	20.1401	20.1420	20.1512	20.1512	20.1529	20.1477	20.1420	20.1380	20.1339	(88)
util rest of house	0.9983	0.9977	0.9960	0.9899	0.9642	0.8535	0.6453	0.6842	0.9147	0.9870	0.9967	0.9986	(89)
MIT 2	18.7635	18.8613	19.0782	19.4156	19.7621	20.0503	20.1370	20.1327	19.9742	19.5627	19.1242	18.7548	(90)
Living area fraction									fLA = Living area / (4) =			0.3663	(91)
MIT	19.2126	19.2987	19.4900	19.7867	20.0944	20.3550	20.4424	20.4366	20.2842	19.9165	19.5291	19.2033	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2126	19.2987	19.4900	19.7867	20.0944	20.3550	20.4424	20.4366	20.2842	19.9165	19.5291	19.2033	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9976	0.9969	0.9949	0.9882	0.9634	0.8687	0.6892	0.7248	0.9213	0.9854	0.9957	0.9980	(94)
Useful gains	333.2303	337.1070	334.3303	328.1598	314.9926	271.5153	204.9765	212.0096	267.2055	292.4678	309.3034	323.0953	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	859.1648	827.1895	744.1687	615.4322	473.3522	320.7264	214.1391	224.4655	346.2154	525.3509	704.4298	854.8171	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	391.2953	329.3355	304.9198	206.8361	117.8196	0.0000	0.0000	0.0000	0.0000	173.2650	284.4910	395.6011	(98)
Space heating												2203.5632	(98)
Space heating per m2											(98) / (4) =	36.3444	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.4000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2359.2753	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	391.2953	329.3355	304.9198	206.8361	117.8196	0.0000	0.0000	0.0000	0.0000	173.2650	284.4910	395.6011	(98)
Space heating efficiency (main heating system 1)													
	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)													
	418.9457	352.6076	326.4666	221.4519	126.1451	0.0000	0.0000	0.0000	0.0000	185.5086	304.5942	423.5557	(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													
	179.0396	156.3957	162.7196	144.3241	139.7312	123.0674	117.9080	131.4398	132.8914	151.3233	161.5347	174.8351	(64)
Efficiency of water heater												80.3000	(216)
(217)m	86.9662	86.8815	86.6095	85.9566	84.6252	80.3000	80.3000	80.3000	80.3000	85.3927	86.4615	87.0444	(217)
Fuel for water heating, kWh/month													
	205.8727	180.0105	187.8774	167.9035	165.1177	153.2596	146.8344	163.6859	165.4936	177.2086	186.8285	200.8574	(219)
Water heating fuel used												2100.9497	(219)
Annual totals kWh/year													
Space heating fuel - main system												2359.2753	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												367.3266	(232)
Total delivered energy for all uses												4902.5517	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2359.2753	0.2160	509.6035	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2100.9497	0.2160	453.8051	(264)
Space and water heating			963.4086	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	367.3266	0.5190	190.6425	(268)
Total CO2, kg/m2/year			1192.9761	(272)
Emissions per m2 for space and water heating			15.8900	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			3.1444	(272b)
Emissions per m2 for pumps and fans			0.6420	(272c)
Target Carbon Dioxide Emission Rate (TER) = (15.8900 * 1.00) + 3.1444 + 0.6420, rounded to 2 d.p.			19.6800	(273)

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

Property Reference	Flat 09 - 1 Hampshire St.	**Issued on Date**	11/05/2020
Assessment Reference	AD - Gas Combi + PV	**Prop Type Ref**	
Property	Flat 9, 1 Hampshire Street, London, NW5 2TE		

SAP Rating	89 B	**DER**	12.55	**TER**	23.83
Environmental	93 A	**% DER<TER**	47.33		
CO_2 Emissions (t/year)	0.35	**DFEE**	51.34	**TFEE**	55.82
General Requirements Compliance	Pass	**% DFEE<TFEE**	8.03		

Assessor Details	Mr. Andrew Gwynne, Andrew Gwynne, Tel: 01636 653055, andrew.gwynne@mesenergyservices.co.uk	**Assessor ID**	P741-0001
Client			

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

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

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

Mid-floor flat, total floor area 41 m²

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

1a TER and DER
Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 23.83 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.55 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)55.8 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)51.3 kWh/m²/yrOK

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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	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.32 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated using user-specified y-value of 0.135

---
3 Air permeability
Air permeability at 50 pascals: 5.00 (design value)
Maximum 10.0 OK

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4 Heating efficiency
Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
tbc tbc
Combi boiler
Efficiency: 89.0% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage No cylinder

---
6 Controls
Space heating controls: Time and temperature zone control OK

Hot water controls: No cylinder

Boiler interlock Yes OK

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

---
8 Mechanical ventilation
Not applicable

---
9 Summertime temperature
Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing North: 2.40 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

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10 Key features
Party wall U-value 0.00 W/m²K
Roof U-value 0.11 W/m²K
Door U-value 1.00 W/m²K
Photovoltaic array 1.00 kW

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	41.1300 (1b)	x	2.4000 (2b)	=	98.7120	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	41.1300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	98.7120	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.2026	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4526	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3847	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4905	0.4809	0.4713	0.4232	0.4136	0.3655	0.3655	0.3559	0.3847	0.4136	0.4328	0.4520	(22b)
Effective ac	0.6203	0.6156	0.6111	0.5895	0.5855	0.5668	0.5668	0.5633	0.5740	0.5855	0.5937	0.6022	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 1.40)			2.4000	1.3258	3.1818			(27)
Ext Door			2.3300	1.0000	2.3300			(26)
Glazed Door			7.5800	1.4000	10.6120			(26a)
External Wall 1	38.9300	12.3100	26.6200	0.1800	4.7916	0.0000	0.0000	(29a)
Wall to Corridor	10.8200		10.8200	0.1679	1.8168	0.0000	0.0000	(29a)
External Roof 1	2.6000		2.6000	0.1100	0.2860	9.0000	23.4000	(30)
Total net area of external elements Aum(A, m2)			52.3500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0182			(33)
Party Wall 1			41.3300	0.0000	0.0000	0.0000	0.0000	(32)
Party Floor 1			41.1300			0.0000	0.0000	(32d)
Party Ceilings 1			38.5300			0.0000	0.0000	(32b)
Stud Wall			60.5800			75.0000	4543.5000	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		4566.9000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							111.0357	(35)
Thermal bridges (User defined value 0.135 * total exposed area)							7.0673	(36)
Total fabric heat loss					(33) + (36) =		30.0855	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.2063	20.0542	19.9050	19.2044	19.0733	18.4631	18.4631	18.3501	18.6982	19.0733	19.3385	19.6157	(38)
Heat transfer coeff	50.2918	50.1396	49.9905	49.2899	49.1588	48.5486	48.5486	48.4356	48.7836	49.1588	49.4240	49.7012	(39)
Average = Sum(39)m / 12 =												49.2892	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2228	1.2191	1.2154	1.1984	1.1952	1.1804	1.1804	1.1776	1.1861	1.1952	1.2017	1.2084	(40)
HLP (average)												1.1984	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.4367 (42)
Average daily hot water use (litres/day)	68.3212 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.1534	72.4205	69.6877	66.9548	64.2220	61.4891	61.4891	64.2220	66.9548	69.6877	72.4205	75.1534	(44)
Energy conte	111.4503	97.4751	100.5856	87.6929	84.1435	72.6094	67.2833	77.2086	78.1307	91.0538	99.3923	107.9336	(45)
Energy content (annual)										Total = Sum(45)m =		1074.9590	(45)

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

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	16.7175	14.6213	15.0878	13.1539	12.6215	10.8914	10.0925	11.5813	11.7196	13.6581	14.9088	16.1900	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	38.2973	33.3333	35.5121	33.0188	32.7268	30.3234	31.3342	32.7268	33.0188	35.5121	35.7142	38.2973	(61)
Total heat required for water heating calculated for each month													
	149.7476	130.8084	136.0976	120.7118	116.8703	102.9328	98.6175	109.9354	111.1495	126.5658	135.1065	146.2309	(62)
WWHRS	-21.0382	-18.5044	-18.8897	-15.5862	-14.4952	-11.9740	-10.1634	-12.2956	-12.6411	-15.5951	-18.0212	-20.3245	eq.(G10)
Total of WWHRS savings												-189.5285	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h													
	128.7094	112.3040	117.2080	105.1255	102.3751	90.9588	88.4541	97.6398	98.5084	110.9707	117.0853	125.9065	(64)
								Total per year (kWh/year) = Sum(64)m =				1295.2457	(64)
Heat gains from water heating, kWh/month													
	46.6315	40.7438	42.3227	37.4126	36.1594	31.7235	30.2052	33.8536	34.2332	39.1534	41.9765	45.4623	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	71.8342	71.8342	71.8342	71.8342	71.8342	71.8342	71.8342	71.8342	71.8342	71.8342	71.8342	71.8342	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	14.1093	12.5318	10.1915	7.7156	5.7675	4.8692	5.2613	6.8389	9.1791	11.6550	13.6031	14.5015	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	124.3855	125.6763	122.4237	115.4993	106.7584	98.5433	93.0551	91.7643	95.0169	101.9414	110.6822	118.8973	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.1834	30.1834	30.1834	30.1834	30.1834	30.1834	30.1834	30.1834	30.1834	30.1834	30.1834	30.1834	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-57.4673	-57.4673	-57.4673	-57.4673	-57.4673	-57.4673	-57.4673	-57.4673	-57.4673	-57.4673	-57.4673	-57.4673	(71)
Water heating gains (Table 5)													
	62.6768	60.6306	56.8854	51.9620	48.6014	44.0604	40.5984	45.5021	47.5460	52.6255	58.3007	61.1052	(72)
Total internal gains													
	248.7219	246.3890	237.0508	222.7271	208.6776	195.0231	186.4651	191.6556	199.2924	213.7722	230.1363	242.0542	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.4000	10.6334	0.7600	0.7000	0.7700	9.4087	(74)

Solar gains	9.4087	17.9804	30.5532	49.0762	66.1101	70.7729	66.0755	52.4225	36.7348	21.4034	11.6068	7.8435	(83)
Total gains	258.1306	264.3694	267.6040	271.8033	274.7877	265.7960	252.5406	244.0781	236.0272	235.1755	241.7431	249.8978	(84)

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7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	25.2245	25.3010	25.3765	25.7372	25.8058	26.1302	26.1302	26.1911	26.0043	25.8058	25.6674	25.5242	
alpha	2.6816	2.6867	2.6918	2.7158	2.7204	2.7420	2.7420	2.7461	2.7336	2.7204	2.7112	2.7016	
util living area													
	0.9703	0.9659	0.9557	0.9319	0.8824	0.7871	0.6689	0.6988	0.8458	0.9308	0.9610	0.9728	(86)
MIT	19.1409	19.2511	19.4970	19.8692	20.2549	20.5950	20.7669	20.7441	20.4882	20.0212	19.5349	19.1261	(87)
Th 2	19.9018	19.9048	19.9077	19.9213	19.9238	19.9357	19.9357	19.9379	19.9311	19.9238	19.9187	19.9133	(88)
util rest of house													
	0.9654	0.9601	0.9475	0.9175	0.8530	0.7233	0.5573	0.5942	0.7963	0.9135	0.9533	0.9682	(89)
MIT 2	17.4148	17.5769	17.9359	18.4820	19.0302	19.4964	19.6984	19.6780	19.3605	18.7055	17.9998	17.4009	(90)
Living area fraction									fLA = Living area / (4) =			0.5400	(91)
MIT	18.3469	18.4810	18.7789	19.2311	19.6915	20.0896	20.2754	20.2537	19.9694	19.4160	18.8288	18.3325	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.1969	18.3310	18.6289	19.0811	19.5415	19.9396	20.1254	20.1037	19.8194	19.2660	18.6788	18.1825	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9552	0.9491	0.9350	0.9034	0.8403	0.7235	0.5797	0.6128	0.7901	0.9001	0.9418	0.9587	(94)
Useful gains	246.5729	250.9190	250.2176	245.5493	230.9148	192.3130	146.3952	149.5700	186.4844	211.6716	227.6686	239.5664	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	698.8986	673.4230	606.3303	501.8249	385.4810	259.2312	171.1516	179.3893	279.0147	426.0077	572.2678	694.9474	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	336.5303	283.9227	264.9478	184.5184	114.9972	0.0000	0.0000	0.0000	0.0000	159.4660	248.1114	338.8034	(98)
Space heating												1931.2974	(98)
Space heating per m2											(98) / (4) =	46.9559	(99)

8c. Space cooling requirement

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	89.9000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	2148.2730	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	336.5303	283.9227	264.9478	184.5184	114.9972	0.0000	0.0000	0.0000	0.0000	159.4660	248.1114	338.8034	(98)
Space heating efficiency (main heating system 1)													
	89.9000	89.9000	89.9000	89.9000	89.9000	0.0000	0.0000	0.0000	0.0000	89.9000	89.9000	89.9000	(210)
Space heating fuel (main heating system)													
	374.3385	315.8206	294.7140	205.2485	127.9168	0.0000	0.0000	0.0000	0.0000	177.3816	275.9860	376.8670	(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													
	128.7094	112.3040	117.2080	105.1255	102.3751	90.9588	88.4541	97.6398	98.5084	110.9707	117.0853	125.9065	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.8587	86.7867	86.5406	85.9516	84.8427	79.8000	79.8000	79.8000	79.8000	85.4615	86.3943	86.9194	(217)
Fuel for water heating, kWh/month													
	148.1826	129.4024	135.4369	122.3077	120.6647	113.9835	110.8447	122.3556	123.4442	129.8487	135.5244	144.8543	(219)
Water heating fuel used												1536.8496	(219)
Annual totals kWh/year													
Space heating fuel - main system												2148.2730	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												249.1753	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.00 * 1080 * 1.00) =										-863.6197		-863.6197	(233)
Total delivered energy for all uses												3145.6782	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2148.2730	0.2160	464.0270	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1536.8496	0.2160	331.9595	(264)
Space and water heating			795.9865	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	249.1753	0.5190	129.3220	(268)
Energy saving/generation technologies				
PV Unit	-863.6197	0.5190	-448.2186	(269)
Total CO2, kg/year			516.0148	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			12.5500	(273)

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

DER		12.5500	ZC1
Total Floor Area	TFA	41.1300	
Assumed number of occupants	N	1.4367	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.9208	ZC2
CO2 emissions from cooking, equation (L16)		3.7316	ZC3
Total CO2 emissions		34.2024	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		34.2024	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	41.1300 (1b)	x	2.4000 (2b)	=	98.7120	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	41.1300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	98.7120	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.2026	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4526	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3847	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4905	0.4809	0.4713	0.4232	0.4136	0.3655	0.3655	0.3559	0.3847	0.4136	0.4328	0.4520	(22b)
Effective ac	0.6203	0.6156	0.6111	0.5895	0.5855	0.5668	0.5668	0.5633	0.5740	0.5855	0.5937	0.6022	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.3300	1.0000	2.3300			(26)
TER Semi-glazed door			7.5800	1.2000	9.0960			(26a)
TER Opening Type (Uw = 1.40)			0.3700	1.3258	0.4905			(27)
External Wall 1	38.9300	10.2800	28.6500	0.1800	5.1570			(29a)
Wall to Corridor	10.8200		10.8200	0.1800	1.9476			(29a)
External Roof 1	2.6000		2.6000	0.1300	0.3380			(30)
Total net area of external elements Aum(A, m2)			52.3500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.3591			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)		5.0230 (36)
Total fabric heat loss	(33) + (36) =	24.3821 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.2063	20.0542	19.9050	19.2044	19.0733	18.4631	18.4631	18.3501	18.6982	19.0733	19.3385	19.6157	(38)
Heat transfer coeff	44.5885	44.4363	44.2871	43.5865	43.4555	42.8452	42.8452	42.7322	43.0803	43.4555	43.7206	43.9979	(39)
Average = Sum(39)m / 12 =												43.5859	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0841	1.0804	1.0768	1.0597	1.0565	1.0417	1.0417	1.0390	1.0474	1.0565	1.0630	1.0697	(40)
HLP (average)												1.0597	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.4367 (42)
Average daily hot water use (litres/day)	68.3212 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.1534	72.4205	69.6877	66.9548	64.2220	61.4891	61.4891	64.2220	66.9548	69.6877	72.4205	75.1534	(44)
Energy conte	111.4503	97.4751	100.5856	87.6929	84.1435	72.6094	67.2833	77.2086	78.1307	91.0538	99.3923	107.9336	(45)
Energy content (annual)										Total = Sum(45)m =		1074.9590	(45)
Distribution loss (46)m = 0.15 x (45)m	16.7175	14.6213	15.0878	13.1539	12.6215	10.8914	10.0925	11.5813	11.7196	13.6581	14.9088	16.1900	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	38.2973	33.3333	35.5121	33.0188	32.7268	30.3234	31.3342	32.7268	33.0188	35.5121	35.7142	38.2973	(61)
Total heat required for water heating calculated for each month													
	149.7476	130.8084	136.0976	120.7118	116.8703	102.9328	98.6175	109.9354	111.1495	126.5658	135.1065	146.2309	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h													
	149.7476	130.8084	136.0976	120.7118	116.8703	102.9328	98.6175	109.9354	111.1495	126.5658	135.1065	146.2309	(64)
								Total per year (kWh/year) = Sum(64)m =				1484.7741	(64)
Heat gains from water heating, kWh/month													
	46.6315	40.7438	42.3227	37.4126	36.1594	31.7235	30.2052	33.8536	34.2332	39.1534	41.9765	45.4623	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	71.8342	71.8342	71.8342	71.8342	71.8342	71.8342	71.8342	71.8342	71.8342	71.8342	71.8342	71.8342	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	16.1292	14.3258	11.6505	8.8202	6.5932	5.5663	6.0145	7.8179	10.4932	13.3235	15.5505	16.5775	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	124.3855	125.6763	122.4237	115.4993	106.7584	98.5433	93.0551	91.7643	95.0169	101.9414	110.6822	118.8973	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.1834	30.1834	30.1834	30.1834	30.1834	30.1834	30.1834	30.1834	30.1834	30.1834	30.1834	30.1834	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-57.4673	-57.4673	-57.4673	-57.4673	-57.4673	-57.4673	-57.4673	-57.4673	-57.4673	-57.4673	-57.4673	-57.4673	(71)
Water heating gains (Table 5)													
	62.6768	60.6306	56.8854	51.9620	48.6014	44.0604	40.5984	45.5021	47.5460	52.6255	58.3007	61.1052	(72)
Total internal gains													
	250.7418	248.1830	238.5098	223.8317	209.5032	195.7202	187.2183	192.6346	200.6065	215.4407	232.0837	244.1302	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	0.3700	10.6334	0.6300	0.7000	0.7700	1.2024	(74)

Solar gains	1.2024	2.2978	3.9046	6.2717	8.4486	9.0445	8.4442	6.6994	4.6946	2.7353	1.4833	1.0024	(83)
Total gains	251.9442	250.4808	242.4144	230.1034	217.9519	204.7647	195.6625	199.3340	205.3010	218.1759	233.5670	245.1326	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	64.0580	64.2774	64.4939	65.5306	65.7282	66.6643	66.6643	66.8406	66.3006	65.7282	65.3296	64.9179	
alpha	5.2705	5.2852	5.2996	5.3687	5.3819	5.4443	5.4443	5.4560	5.4200	5.3819	5.3553	5.3279	
util living area													
	0.9978	0.9975	0.9964	0.9934	0.9831	0.9391	0.8287	0.8391	0.9541	0.9896	0.9963	0.9981	(86)
MIT	19.8601	19.9232	20.0729	20.3063	20.5589	20.8092	20.9386	20.9317	20.7641	20.4517	20.1299	19.8541	(87)
Th 2	20.0139	20.0169	20.0199	20.0339	20.0365	20.0487	20.0487	20.0510	20.0440	20.0365	20.0312	20.0256	(88)
util rest of house													
	0.9971	0.9966	0.9950	0.9903	0.9731	0.8945	0.7073	0.7264	0.9210	0.9840	0.9948	0.9975	(89)
MIT 2	18.4925	18.5871	18.8079	19.1586	19.5255	19.8771	20.0167	20.0127	19.8157	19.3718	18.8996	18.4923	(90)
Living area fraction									fLA = Living area / (4) =			0.5400	(91)
MIT	19.2310	19.3086	19.4910	19.7784	20.0836	20.3804	20.5145	20.5090	20.3279	19.9549	19.5639	19.2277	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2310	19.3086	19.4910	19.7784	20.0836	20.3804	20.5145	20.5090	20.3279	19.9549	19.5639	19.2277	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9963	0.9957	0.9940	0.9893	0.9737	0.9130	0.7732	0.7869	0.9329	0.9834	0.9939	0.9968	(94)
Useful gains	251.0075	249.4086	240.9703	227.6367	212.2209	186.9407	151.2766	156.8596	191.5286	214.5591	232.1316	244.3507	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	665.7487	640.2643	575.3340	474.1496	364.3115	247.6644	167.7184	175.5859	268.2979	406.5233	544.9315	661.1862	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	308.5674	262.6551	248.7666	177.4893	113.1554	0.0000	0.0000	0.0000	0.0000	142.8214	225.2159	310.1256	(98)
Space heating												1788.7967	(98)
Space heating per m2											(98) / (4) =	43.4913	(99)

8c. Space cooling requirement

Not applicable

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

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.4000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												1915.1999	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	308.5674	262.6551	248.7666	177.4893	113.1554	0.0000	0.0000	0.0000	0.0000	142.8214	225.2159	310.1256	(98)
Space heating efficiency (main heating system 1)													
	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)													
	330.3720	281.2153	266.3453	190.0314	121.1514	0.0000	0.0000	0.0000	0.0000	152.9137	241.1305	332.0403	(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													
	149.7476	130.8084	136.0976	120.7118	116.8703	102.9328	98.6175	109.9354	111.1495	126.5658	135.1065	146.2309	(64)
Efficiency of water heater												80.3000	(216)
(217)m	86.8316	86.7716	86.5504	86.0203	84.9700	80.3000	80.3000	80.3000	80.3000	85.3560	86.3286	86.8977	(217)
Fuel for water heating, kWh/month													
	172.4576	150.7502	157.2467	140.3294	137.5430	128.1853	122.8113	136.9058	138.4178	148.2800	156.5027	168.2794	(219)
Water heating fuel used												1757.7092	(219)
Annual totals kWh/year													
Space heating fuel - main system												1915.1999	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												284.8466	(232)
Total delivered energy for all uses												4032.7558	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1915.1999	0.2160	413.6832	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1757.7092	0.2160	379.6652	(264)
Space and water heating			793.3484	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	284.8466	0.5190	147.8354	(268)
Total CO2, kg/m2/year			980.1088	(272)
Emissions per m2 for space and water heating			19.2888	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			3.5943	(272b)
Emissions per m2 for pumps and fans			0.9464	(272c)
Target Carbon Dioxide Emission Rate (TER) = (19.2888 * 1.00) + 3.5943 + 0.9464, rounded to 2 d.p.			23.8300	(273)

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

Property Reference	Flat 10 - 1 Hampshire St.	**Issued on Date**	11/05/2020
Assessment Reference	AD - Gas Combi + PV	**Prop Type Ref**	
Property	Flat 10, 1 Hampshire Street, London, NW5 2TE		

SAP Rating	89 B	**DER**	11.79	**TER**	22.77
Environmental	94 A	**% DER<TER**	48.21		
CO_2 Emissions (t/year)	0.33	**DFEE**	47.67	**TFEE**	51.33
General Requirements Compliance	Pass	**% DFEE<TFEE**	7.13		

Assessor Details	Mr. Andrew Gwynne, Andrew Gwynne, Tel: 01636 653055, andrew.gwynne@mesenergyservices.co.uk	**Assessor ID**	P741-0001
Client			

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

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 area 42 m²

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

1a TER and DER
Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 22.77 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 11.79 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)51.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)47.7 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.32 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated using user-specified y-value of 0.178

3 Air permeability
Air permeability at 50 pascals: 5.00 (design value)
Maximum 10.0 OK

4 Heating efficiency
Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
tbc tbc
Combi boiler
Efficiency: 89.0% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

5 Cylinder insulation
Hot water storage No cylinder

6 Controls
Space heating controls: Time and temperature zone control OK

Hot water controls: No cylinder

Boiler interlock Yes OK

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

8 Mechanical ventilation
Not applicable

9 Summertime temperature
Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing North: 2.40 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

10 Key features
Party wall U-value 0.00 W/m²K
Roof U-value 0.11 W/m²K
Door U-value 1.00 W/m²K
Photovoltaic array 1.00 kW

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	42.0400 (1b)	x	2.4000 (2b)	=	100.8960	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	42.0400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	100.8960	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1982	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4482	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3810	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4858	0.4762	0.4667	0.4191	0.4096	0.3619	0.3619	0.3524	0.3810	0.4096	0.4286	0.4477	(22b)
Effective ac	0.6180	0.6134	0.6089	0.5878	0.5839	0.5655	0.5655	0.5621	0.5726	0.5839	0.5919	0.6002	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 1.40)			2.4000	1.3258	3.1818			(27)
Ext Door			2.3300	1.0000	2.3300			(26)
Glazed Door			7.5800	1.4000	10.6120			(26a)
External Wall 1	26.0700	12.3100	13.7600	0.1800	2.4768	0.0000	0.0000	(29a)
Wall to Corridor	10.8200		10.8200	0.1679	1.8168	0.0000	0.0000	(29a)
Flat Roof to Terrace	2.8600		2.8600	0.1100	0.3146	9.0000	25.7400	(30)
Total net area of external elements Aum(A, m2)			39.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.7320			(33)
Party Wall 1			42.5800	0.0000	0.0000	0.0000	0.0000	(32)
Party Floor 1			42.0400			0.0000	0.0000	(32d)
Party Ceilings 1			39.1800			0.0000	0.0000	(32b)
Stud Wall			60.6200			75.0000	4546.5000	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		4572.2400	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							108.7593	(35)
Thermal bridges (User defined value 0.178 * total exposed area)							7.0755	(36)
Total fabric heat loss						(33) + (36) =	27.8075	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.5762	20.4236	20.2741	19.5718	19.4404	18.8287	18.8287	18.7155	19.0643	19.4404	19.7062	19.9841	(38)
Heat transfer coeff	48.3837	48.2311	48.0816	47.3793	47.2479	46.6362	46.6362	46.5230	46.8718	47.2479	47.5137	47.7916	(39)
Average = Sum(39)m / 12 =												47.3787	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1509	1.1473	1.1437	1.1270	1.1239	1.1093	1.1093	1.1066	1.1149	1.1239	1.1302	1.1368	(40)
HLP (average)												1.1270	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.4616	(42)
Average daily hot water use (litres/day)	68.9118	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.8030	73.0465	70.2901	67.5336	64.7771	62.0206	62.0206	64.7771	67.5336	70.2901	73.0465	75.8030	(44)
Energy conte	112.4137	98.3177	101.4551	88.4510	84.8708	73.2371	67.8649	77.8760	78.8061	91.8409	100.2515	108.8666	(45)
Energy content (annual)										Total = Sum(45)m =		1084.2514	(45)
Distribution loss (46)m = 0.15 x (45)m													

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	16.8621	14.7477	15.2183	13.2676	12.7306	10.9856	10.1797	11.6814	11.8209	13.7761	15.0377	16.3300	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	38.6284	33.6214	35.8190	33.3042	33.0097	30.5855	31.6050	33.0097	33.3042	35.8190	36.0229	38.6284	(61)
Total heat required for water heating calculated for each month													
	151.0421	131.9391	137.2741	121.7552	117.8805	103.8226	99.4700	110.8857	112.1103	127.6599	136.2745	147.4950	(62)
WWHRS	-21.3183	-18.7510	-19.1413	-15.7924	-14.6861	-12.1312	-10.2958	-12.4562	-12.8066	-15.8004	-18.2599	-20.5954	eq.(G10)
Total of WWHRS savings												-192.0346	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h													
	129.7237	113.1882	118.1328	105.9628	103.1944	91.6914	89.1741	98.4295	99.3037	111.8595	118.0146	126.8996	(64)
								Total per year (kWh/year) = Sum(64)m =				1305.5744	(64)
Heat gains from water heating, kWh/month													
	47.0346	41.0960	42.6886	37.7360	36.4720	31.9977	30.4663	34.1462	34.5291	39.4919	42.3394	45.8553	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	73.0775	73.0775	73.0775	73.0775	73.0775	73.0775	73.0775	73.0775	73.0775	73.0775	73.0775	73.0775	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	14.4176	12.8055	10.4142	7.8842	5.8935	4.9756	5.3763	6.9883	9.3797	11.9096	13.9003	14.8183	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	126.6961	128.0108	124.6978	117.6448	108.7416	100.3738	94.7837	93.4690	96.7820	103.8350	112.7382	121.1060	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.3078	30.3078	30.3078	30.3078	30.3078	30.3078	30.3078	30.3078	30.3078	30.3078	30.3078	30.3078	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-58.4620	-58.4620	-58.4620	-58.4620	-58.4620	-58.4620	-58.4620	-58.4620	-58.4620	-58.4620	-58.4620	-58.4620	(71)
Water heating gains (Table 5)													
	63.2186	61.1548	57.3771	52.4111	49.0215	44.4413	40.9494	45.8954	47.9571	53.0804	58.8047	61.6334	(72)
Total internal gains													
	252.2555	249.8944	240.4123	225.8634	211.5798	197.7139	189.0326	194.2759	202.0419	216.7484	233.3664	245.4809	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.4000	10.6334	0.7600	0.7000	0.7700	9.4087	(74)

Solar gains	9.4087	17.9804	30.5532	49.0762	66.1101	70.7729	66.0755	52.4225	36.7348	21.4034	11.6068	7.8435	(83)
Total gains	261.6642	267.8748	270.9655	274.9396	277.6900	268.4868	255.1081	246.6984	238.7767	238.1517	244.9732	253.3244	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	26.2499	26.3329	26.4148	26.8064	26.8809	27.2335	27.2335	27.2998	27.0966	26.8809	26.7305	26.5751	
alpha	2.7500	2.7555	2.7610	2.7871	2.7921	2.8156	2.8156	2.8200	2.8064	2.7921	2.7820	2.7717	
util living area													
	0.9691	0.9645	0.9537	0.9284	0.8761	0.7756	0.6533	0.6837	0.8369	0.9271	0.9592	0.9717	(86)
MIT	19.2242	19.3323	19.5715	19.9334	20.3048	20.6277	20.7863	20.7655	20.5258	20.0774	19.6068	19.2101	(87)
Th 2	19.9595	19.9624	19.9653	19.9788	19.9814	19.9932	19.9932	19.9954	19.9887	19.9814	19.9762	19.9709	(88)
util rest of house													
	0.9642	0.9586	0.9454	0.9140	0.8468	0.7134	0.5471	0.5837	0.7881	0.9098	0.9515	0.9671	(89)
MIT 2	17.5760	17.7350	18.0842	18.6151	19.1422	19.5839	19.7695	19.7512	19.4545	18.8270	18.1444	17.5632	(90)
Living area fraction									fLA = Living area / (4) =			0.5464	(91)
MIT	18.4766	18.6077	18.8969	19.3354	19.7774	20.1542	20.3251	20.3054	20.0398	19.5102	18.9435	18.4630	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.3266	18.4577	18.7469	19.1854	19.6274	20.0042	20.1751	20.1554	19.8898	19.3602	18.7935	18.3130	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9540	0.9477	0.9331	0.9002	0.8347	0.7142	0.5684	0.6015	0.7825	0.8965	0.9400	0.9576	(94)
Useful gains	249.6322	253.8619	252.8281	247.4907	231.7881	191.7413	144.9995	148.4004	186.8385	213.5133	230.2751	242.5766	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	678.6563	653.9040	588.8487	487.3160	374.5537	252.0313	166.7276	174.7115	271.3787	413.9015	555.5995	674.4838	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	319.1939	268.8283	249.9993	172.6742	106.2176	0.0000	0.0000	0.0000	0.0000	149.0889	234.2336	321.3389	(98)
Space heating												1821.5748	(98)
Space heating per m2											(98) / (4) =	43.3296	(99)

8c. Space cooling requirement

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.9000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2026.2233	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	319.1939	268.8283	249.9993	172.6742	106.2176	0.0000	0.0000	0.0000	0.0000	149.0889	234.2336	321.3389	(98)
Space heating efficiency (main heating system 1)													
	89.9000	89.9000	89.9000	89.9000	89.9000	0.0000	0.0000	0.0000	0.0000	89.9000	89.9000	89.9000	(210)
Space heating fuel (main heating system)													
	355.0544	299.0304	278.0860	192.0737	118.1508	0.0000	0.0000	0.0000	0.0000	165.8386	260.5490	357.4404	(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													
	129.7237	113.1882	118.1328	105.9628	103.1944	91.6914	89.1741	98.4295	99.3037	111.8595	118.0146	126.8996	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.7280	86.6506	86.3912	85.7716	84.6221	79.8000	79.8000	79.8000	79.8000	85.2735	86.2430	86.7901	(217)
Fuel for water heating, kWh/month													
	149.5754	130.6260	136.7417	123.5406	121.9473	114.9015	111.7470	123.3452	124.4408	131.1774	136.8396	146.2143	(219)
Water heating fuel used												1551.0968	(219)
Annual totals kWh/year													
Space heating fuel - main system												2026.2233	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												254.6185	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.00 * 1080 * 1.00) =										-863.6197		-863.6197	(233)
Total delivered energy for all uses												3043.3189	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2026.2233	0.2160	437.6642	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1551.0968	0.2160	335.0369	(264)
Space and water heating			772.7011	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	254.6185	0.5190	132.1470	(268)
Energy saving/generation technologies				
PV Unit	-863.6197	0.5190	-448.2186	(269)
Total CO2, kg/year			495.5545	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			11.7900	(273)

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

DER		11.7900	ZC1
Total Floor Area	TFA	42.0400	
Assumed number of occupants	N	1.4616	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.8586	ZC2
CO2 emissions from cooking, equation (L16)		3.6650	ZC3
Total CO2 emissions		33.3136	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		33.3136	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	42.0400 (1b)	x	2.4000 (2b)	=	100.8960	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	42.0400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	100.8960	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1982	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4482	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3810	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4858	0.4762	0.4667	0.4191	0.4096	0.3619	0.3619	0.3524	0.3810	0.4096	0.4286	0.4477	(22b)
Effective ac	0.6180	0.6134	0.6089	0.5878	0.5839	0.5655	0.5655	0.5621	0.5726	0.5839	0.5919	0.6002	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.3300	1.0000	2.3300			(26)
TER Semi-glazed door			7.5800	1.2000	9.0960			(26a)
TER Opening Type (Uw = 1.40)			0.6000	1.3258	0.7955			(27)
External Wall 1	26.0700	10.5100	15.5600	0.1800	2.8008			(29a)
Wall to Corridor	10.8200		10.8200	0.1800	1.9476			(29a)
Flat Roof to Terrace	2.8600		2.8600	0.1300	0.3718			(30)
Total net area of external elements Aum(A, m2)			39.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.3417			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	5.0410	(36)
Total fabric heat loss (33) + (36) =	22.3827	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.5762	20.4236	20.2741	19.5718	19.4404	18.8287	18.8287	18.7155	19.0643	19.4404	19.7062	19.9841	(38)
Heat transfer coeff	42.9588	42.8063	42.6567	41.9545	41.8231	41.2114	41.2114	41.0981	41.4470	41.8231	42.0889	42.3668	(39)
Average = Sum(39)m / 12 =												41.9538	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0219	1.0182	1.0147	0.9980	0.9948	0.9803	0.9803	0.9776	0.9859	0.9948	1.0012	1.0078	(40)
HLP (average)												0.9980	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.4616 (42)
Average daily hot water use (litres/day)	68.9118 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.8030	73.0465	70.2901	67.5336	64.7771	62.0206	62.0206	64.7771	67.5336	70.2901	73.0465	75.8030	(44)
Energy conte	112.4137	98.3177	101.4551	88.4510	84.8708	73.2371	67.8649	77.8760	78.8061	91.8409	100.2515	108.8666	(45)
Energy content (annual)										Total = Sum(45)m =		1084.2514	(45)
Distribution loss (46)m = 0.15 x (45)m	16.8621	14.7477	15.2183	13.2676	12.7306	10.9856	10.1797	11.6814	11.8209	13.7761	15.0377	16.3300	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	38.6284	33.6214	35.8190	33.3042	33.0097	30.5855	31.6050	33.0097	33.3042	35.8190	36.0229	38.6284	(61)
Total heat required for water heating calculated for each month													
	151.0421	131.9391	137.2741	121.7552	117.8805	103.8226	99.4700	110.8857	112.1103	127.6599	136.2745	147.4950	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h													
	151.0421	131.9391	137.2741	121.7552	117.8805	103.8226	99.4700	110.8857	112.1103	127.6599	136.2745	147.4950	(64)
								Total per year (kWh/year) = Sum(64)m =				1497.6091	(64)
Heat gains from water heating, kWh/month													
	47.0346	41.0960	42.6886	37.7360	36.4720	31.9977	30.4663	34.1462	34.5291	39.4919	42.3394	45.8553	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	73.0775	73.0775	73.0775	73.0775	73.0775	73.0775	73.0775	73.0775	73.0775	73.0775	73.0775	73.0775	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	16.1839	14.3744	11.6900	8.8501	6.6156	5.5851	6.0349	7.8444	10.5288	13.3687	15.6033	16.6337	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	126.6961	128.0108	124.6978	117.6448	108.7416	100.3738	94.7837	93.4690	96.7820	103.8350	112.7382	121.1060	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.3078	30.3078	30.3078	30.3078	30.3078	30.3078	30.3078	30.3078	30.3078	30.3078	30.3078	30.3078	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-58.4620	-58.4620	-58.4620	-58.4620	-58.4620	-58.4620	-58.4620	-58.4620	-58.4620	-58.4620	-58.4620	-58.4620	(71)
Water heating gains (Table 5)													
	63.2186	61.1548	57.3771	52.4111	49.0215	44.4413	40.9494	45.8954	47.9571	53.0804	58.8047	61.6334	(72)
Total internal gains													
	254.0219	251.4632	241.6882	226.8293	212.3019	198.3235	189.6912	195.1321	203.1911	218.2074	235.0694	247.2963	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	0.6000	10.6334	0.6300	0.7000	0.7700	1.9498	(74)

Solar gains	1.9498	3.7262	6.3317	10.1704	13.7005	14.6667	13.6933	10.8639	7.6128	4.4356	2.4054	1.6255	(83)
Total gains	255.9717	255.1894	248.0199	236.9997	226.0023	212.9902	203.3845	205.9959	210.8039	222.6430	237.4747	248.9218	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	67.9592	68.2013	68.4404	69.5860	69.8047	70.8407	70.8407	71.0360	70.4380	69.8047	69.3638	68.9088	
alpha	5.5306	5.5468	5.5627	5.6391	5.6536	5.7227	5.7227	5.7357	5.6959	5.6536	5.6243	5.5939	
util living area													
	0.9978	0.9975	0.9963	0.9927	0.9800	0.9257	0.7983	0.8127	0.9468	0.9888	0.9963	0.9982	(86)
MIT	19.9433	20.0051	20.1493	20.3742	20.6150	20.8465	20.9563	20.9501	20.8011	20.5062	20.1999	19.9375	(87)
Th 2	20.0652	20.0682	20.0711	20.0850	20.0876	20.0998	20.0998	20.1020	20.0951	20.0876	20.0824	20.0769	(88)
util rest of house													
	0.9971	0.9966	0.9949	0.9894	0.9687	0.8764	0.6771	0.6996	0.9110	0.9829	0.9948	0.9976	(89)
MIT 2	18.6513	18.7440	18.9569	19.2950	19.6436	19.9648	20.0778	20.0749	19.9047	19.4884	19.0392	18.6515	(90)
Living area fraction									fLA = Living area / (4) =			0.5464	(91)
MIT	19.3572	19.4331	19.6084	19.8846	20.1744	20.4465	20.5578	20.5531	20.3945	20.0445	19.6734	19.3542	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3572	19.4331	19.6084	19.8846	20.1744	20.4465	20.5578	20.5531	20.3945	20.0445	19.6734	19.3542	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9964	0.9958	0.9939	0.9884	0.9700	0.8983	0.7439	0.7613	0.9250	0.9825	0.9939	0.9969	(94)
Useful gains	255.0517	254.1124	246.5130	234.2595	219.2295	191.3391	151.2914	156.8293	194.9917	218.7575	236.0230	248.1597	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	646.8404	622.1072	559.1607	460.8539	354.4237	240.9437	163.1061	170.6836	260.8870	394.9975	529.1991	642.0327	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	291.4908	247.2925	232.6099	163.1480	100.5845	0.0000	0.0000	0.0000	0.0000	131.1225	211.0867	293.0415	(98)
Space heating												1670.3766	(98)
Space heating per m2											(98) / (4) =	39.7330	(99)

8c. Space cooling requirement

Not applicable

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

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.4000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												1788.4118	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	291.4908	247.2925	232.6099	163.1480	100.5845	0.0000	0.0000	0.0000	0.0000	131.1225	211.0867	293.0415	(98)
Space heating efficiency (main heating system 1)													
	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)													
	312.0887	264.7671	249.0470	174.6767	107.6922	0.0000	0.0000	0.0000	0.0000	140.3882	226.0029	313.7490	(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													
	151.0421	131.9391	137.2741	121.7552	117.8805	103.8226	99.4700	110.8857	112.1103	127.6599	136.2745	147.4950	(64)
Efficiency of water heater												80.3000	(216)
(217)m	86.6789	86.6100	86.3683	85.7887	84.6546	80.3000	80.3000	80.3000	80.3000	85.1186	86.1490	86.7470	(217)
Fuel for water heating, kWh/month													
	174.2547	152.3371	158.9403	141.9246	139.2488	129.2934	123.8729	138.0893	139.6143	149.9789	158.1846	170.0291	(219)
Water heating fuel used												1775.7680	(219)
Annual totals kWh/year													
Space heating fuel - main system												1788.4118	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												285.8123	(232)
Total delivered energy for all uses												3924.9920	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1788.4118	0.2160	386.2969	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1775.7680	0.2160	383.5659	(264)
Space and water heating			769.8628	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	285.8123	0.5190	148.3366	(268)
Total CO2, kg/m2/year			957.1244	(272)
Emissions per m2 for space and water heating			18.3126	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			3.5285	(272b)
Emissions per m2 for pumps and fans			0.9259	(272c)
Target Carbon Dioxide Emission Rate (TER) = (18.3126 * 1.00) + 3.5285 + 0.9259, rounded to 2 d.p.			22.7700	(273)

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

Property Reference	Flat 11 - 1 Hampshire St.	**Issued on Date**	11/05/2020
Assessment Reference	AD - Gas Combi + PV	**Prop Type Ref**	
Property	Flat 11, 1 Hampshire Street, London, NW5 2TE		

SAP Rating	90 B	**DER**	9.76	**TER**	22.16
Environmental	95 A	**% DER<TER**	55.96		
CO_2 Emissions (t/year)	0.26	**DFEE**	42.72	**TFEE**	48.32
General Requirements Compliance	Pass	**% DFEE<TFEE**	11.59		

Assessor Details	Mr. Andrew Gwynne, Andrew Gwynne, Tel: 01636 653055, andrew.gwynne@mesenergyservices.co.uk	**Assessor ID**	P741-0001
Client			

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

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

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

Mid-floor flat, total floor area 40 m²

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

1a TER and DER
Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 22.16 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 9.76 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)48.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)42.7 kWh/m²/yrOK

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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	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.31 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated using user-specified y-value of 0.164

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3 Air permeability
Air permeability at 50 pascals: 5.00 (design value)
Maximum 10.0 OK

---
4 Heating efficiency
Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
tbc tbc
Combi boiler
Efficiency: 89.0% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage No cylinder

---
6 Controls
Space heating controls: Time and temperature zone control OK

Hot water controls: No cylinder

Boiler interlock Yes OK

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

---
8 Mechanical ventilation
Not applicable

---
9 Summertime temperature
Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing North: 2.57 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Roof U-value 0.11 W/m²K
Door U-value 1.00 W/m²K
Photovoltaic array 1.00 kW

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	39.7900 (1b)	x	2.4000 (2b)	=	95.4960	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.7900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	95.4960	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.2094	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4594	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3905	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4979	0.4881	0.4784	0.4296	0.4198	0.3710	0.3710	0.3612	0.3905	0.4198	0.4393	0.4589	(22b)
Effective ac	0.6240	0.6191	0.6144	0.5923	0.5881	0.5688	0.5688	0.5652	0.5763	0.5881	0.5965	0.6053	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 1.40)			2.5700	1.3258	3.4072			(27)
Ext Door			2.3300	1.0000	2.3300			(26)
Glazed Door			5.6200	1.4000	7.8680			(26a)
External Wall 1	30.9900	10.5200	20.4700	0.1800	3.6846	0.0000	0.0000	(29a)
Flat Roof to Terrace	3.5100		3.5100	0.1100	0.3861	9.0000	31.5900	(30)
Total net area of external elements Aum(A, m2)			34.5000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.6759			(33)
Party Wall 1			52.0000	0.0000	0.0000	0.0000	0.0000	(32)
Party Floor 1			39.7900			0.0000	0.0000	(32d)
Party Ceilings 1			36.2800			0.0000	0.0000	(32b)
Stud Wall			52.0800			75.0000	3906.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	3937.5900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		98.9593 (35)
Thermal bridges (User defined value 0.164 * total exposed area)		5.6580 (36)
Total fabric heat loss	(33) + (36) =	23.3339 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.6632	19.5115	19.3628	18.6645	18.5338	17.9255	17.9255	17.8129	18.1598	18.5338	18.7981	19.0745	(38)
Heat transfer coeff	42.9971	42.8454	42.6967	41.9983	41.8677	41.2594	41.2594	41.1468	41.4937	41.8677	42.1320	42.4084	(39)
Average = Sum(39)m / 12 =												41.9977	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0806	1.0768	1.0731	1.0555	1.0522	1.0369	1.0369	1.0341	1.0428	1.0522	1.0589	1.0658	(40)
HLP (average)												1.0555	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.4008 (42)
Average daily hot water use (litres/day)	67.4682 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	74.2150	71.5163	68.8175	66.1188	63.4201	60.7214	60.7214	63.4201	66.1188	68.8175	71.5163	74.2150	(44)
Energy conte	110.0587	96.2580	99.3297	86.5980	83.0929	71.7028	66.4432	76.2445	77.1551	89.9169	98.1513	106.5860	(45)
Energy content (annual)										Total = Sum(45)m =		1061.5372	(45)
Distribution loss (46)m = 0.15 x (45)m	16.5088	14.4387	14.8995	12.9897	12.4639	10.7554	9.9665	11.4367	11.5733	13.4875	14.7227	15.9879	(46)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Water storage loss:
Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	37.8191	32.9171	35.0687	32.6065	32.3182	29.9448	30.9429	32.3182	32.6065	35.0687	35.2683	37.8191 (61)

Total heat required for water heating calculated for each month

	147.8778	129.1751	134.3983	119.2046	115.4110	101.6476	97.3861	108.5627	109.7617	124.9856	133.4196	144.4051 (62)
WWHRS	-20.6335	-18.1481	-18.5262	-15.2885	-14.2193	-11.7469	-9.9721	-12.0637	-12.4020	-15.2987	-17.6766	-19.9331 eq.(G10)

Total of WWHRS savings -185.9086

Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)

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

Output from w/h

	127.2443	111.0270	115.8721	103.9161	101.1917	89.9007	87.4141	96.4990	97.3597	109.6869	115.7430	124.4721 (64)

Total per year (kWh/year) = Sum(64)m = 1280.3267 (64)

Heat gains from water heating, kWh/month

	46.0493	40.2351	41.7943	36.9455	35.7079	31.3274	29.8281	33.4309	33.8057	38.6645	41.4524	44.8946 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	70.0383	70.0383	70.0383	70.0383	70.0383	70.0383	70.0383	70.0383	70.0383	70.0383	70.0383	70.0383	(66)

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

	13.5132	12.0023	9.7609	7.3897	5.5239	4.6635	5.0390	6.5499	8.7913	11.1626	13.0284	13.8888 (67)

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

	121.0056	122.2613	119.0971	112.3608	103.8575	95.8656	90.5265	89.2708	92.4351	99.1713	107.6746	115.6665 (68)

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

	30.0038	30.0038	30.0038	30.0038	30.0038	30.0038	30.0038	30.0038	30.0038	30.0038	30.0038	30.0038 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-56.0306	-56.0306	-56.0306	-56.0306	-56.0306	-56.0306	-56.0306	-56.0306	-56.0306	-56.0306	-56.0306	-56.0306 (71)

Water heating gains (Table 5)

	61.8942	59.8736	56.1751	51.3132	47.9945	43.5103	40.0915	44.9339	46.9524	51.9685	57.5728	60.3422 (72)

Total internal gains

	243.4245	241.1487	232.0446	218.0751	204.3874	191.0508	182.6686	187.7662	195.1902	209.3138	225.2873	236.9090 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.5700	10.6334	0.7600	0.7000	0.7700	10.0751	(74)

Solar gains	10.0751	19.2541	32.7173	52.5524	70.7929	75.7859	70.7559	56.1358	39.3368	22.9194	12.4289	8.3991	(83)
Total gains	253.4996	260.4027	264.7619	270.6275	275.1803	266.8367	253.4244	243.9020	234.5271	232.2333	237.7162	245.3081	(84)

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7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	25.4383	25.5284	25.6173	26.0433	26.1246	26.5097	26.5097	26.5823	26.3600	26.1246	25.9607	25.7915	
alpha	2.6959	2.7019	2.7078	2.7362	2.7416	2.7673	2.7673	2.7722	2.7573	2.7416	2.7307	2.7194	
util living area	0.9601	0.9540	0.9401	0.9079	0.8443	0.7307	0.6035	0.6363	0.8022	0.9080	0.9475	0.9632	(86)
MIT	18.8021	18.9534	19.2812	19.7736	20.2654	20.6751	20.8655	20.8395	20.5392	19.9495	19.3182	18.7834	(87)
Th 2	20.0167	20.0198	20.0229	20.0373	20.0400	20.0527	20.0527	20.0550	20.0478	20.0400	20.0346	20.0289	(88)
util rest of house	0.9543	0.9472	0.9306	0.8917	0.8130	0.6692	0.5057	0.5428	0.7523	0.8888	0.9387	0.9579	(89)
MIT 2	17.0744	17.2956	17.7720	18.4878	19.1805	19.7329	19.9541	19.9309	19.5641	18.7464	17.8350	17.0543	(90)

Living area fraction fLA = Living area / (4) = 0.4569 (91)

MIT	17.8638	18.0530	18.4616	19.0753	19.6762	20.1634	20.3705	20.3460	20.0096	19.2961	18.5127	17.8443	(92)

Temperature adjustment -0.1500

adjusted MIT	17.7138	17.9030	18.3116	18.9253	19.5262	20.0134	20.2205	20.1960	19.8596	19.1461	18.3627	17.6943	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9358	0.9274	0.9087	0.8681	0.7930	0.6663	0.5245	0.5581	0.7407	0.8661	0.9182	0.9404	(94)
Useful gains	237.2296	241.5050	240.5765	234.9351	218.2305	177.7974	132.9313	136.1314	173.7207	201.1473	218.2755	230.6809	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	576.7546	557.1203	504.3148	421.0457	327.6632	223.3533	149.3814	156.1948	238.9871	357.8051	474.5197	572.2728	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	252.6066	212.0935	196.2213	133.9997	81.4180	0.0000	0.0000	0.0000	0.0000	116.5534	184.4958	254.1443	(98)

Space heating 1431.5324 (98)

Space heating per m2 (98) / (4) = 35.9772 (99)

8c. Space cooling requirement

Not applicable

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.9000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												1592.3608	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	252.6066	212.0935	196.2213	133.9997	81.4180	0.0000	0.0000	0.0000	0.0000	116.5534	184.4958	254.1443	(98)
Space heating efficiency (main heating system 1)													
	89.9000	89.9000	89.9000	89.9000	89.9000	0.0000	0.0000	0.0000	0.0000	89.9000	89.9000	89.9000	(210)
Space heating fuel (main heating system)													
	280.9862	235.9215	218.2662	149.0542	90.5650	0.0000	0.0000	0.0000	0.0000	129.6478	205.2233	282.6967	(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													
	127.2443	111.0270	115.8721	103.9161	101.1917	89.9007	87.4141	96.4990	97.3597	109.6869	115.7430	124.4721	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.2435	86.1533	85.8651	85.1906	84.0080	79.8000	79.8000	79.8000	79.8000	84.7024	85.7177	86.3087	(217)
Fuel for water heating, kWh/month													
	147.5408	128.8715	134.9467	121.9807	120.4548	112.6575	109.5414	120.9261	122.0046	129.4967	135.0282	144.2172	(219)
Water heating fuel used												1527.6664	(219)
Annual totals kWh/year													
Space heating fuel - main system												1592.3608	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												238.6475	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.00 * 1080 * 1.00) =										-863.6197		-863.6197	(233)
Total delivered energy for all uses												2570.0550	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1592.3608	0.2160	343.9499	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1527.6664	0.2160	329.9759	(264)
Space and water heating			673.9259	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	238.6475	0.5190	123.8580	(268)
Energy saving/generation technologies				
PV Unit	-863.6197	0.5190	-448.2186	(269)
Total CO2, kg/year			388.4903	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			9.7600	(273)

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

DER		9.7600	ZC1
Total Floor Area	TFA	39.7900	
Assumed number of occupants	N	1.4008	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		18.0210	ZC2
CO2 emissions from cooking, equation (L16)		3.8356	ZC3
Total CO2 emissions		31.6166	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		31.6166	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	39.7900 (1b)	x	2.4000 (2b)	=	95.4960	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.7900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	95.4960	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.2094	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4594	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3905	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4979	0.4881	0.4784	0.4296	0.4198	0.3710	0.3710	0.3612	0.3905	0.4198	0.4393	0.4589	(22b)
Effective ac	0.6240	0.6191	0.6144	0.5923	0.5881	0.5688	0.5688	0.5652	0.5763	0.5881	0.5965	0.6053	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.3300	1.0000	2.3300			(26)
TER Semi-glazed door			5.6200	1.2000	6.7440			(26a)
TER Opening Type (Uw = 1.40)			2.0000	1.3258	2.6515			(27)
External Wall 1	30.9900	9.9500	21.0400	0.1800	3.7872			(29a)
Flat Roof to Terrace	3.5100		3.5100	0.1300	0.4563			(30)
Total net area of external elements Aum(A, m2)			34.5000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.9690			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.7504	(36)
Total fabric heat loss						(33) + (36) =	20.7194	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.6632	19.5115	19.3628	18.6645	18.5338	17.9255	17.9255	17.8129	18.1598	18.5338	18.7981	19.0745	(38)
Heat transfer coeff	40.3826	40.2309	40.0822	39.3839	39.2532	38.6449	38.6449	38.5323	38.8792	39.2532	39.5175	39.7939	(39)
Average = Sum(39)m / 12 =												39.3832	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0149	1.0111	1.0073	0.9898	0.9865	0.9712	0.9712	0.9684	0.9771	0.9865	0.9932	1.0001	(40)
HLP (average)												0.9898	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.4008 (42)
Average daily hot water use (litres/day)		67.4682 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	74.2150	71.5163	68.8175	66.1188	63.4201	60.7214	60.7214	63.4201	66.1188	68.8175	71.5163	74.2150	(44)
Energy conte	110.0587	96.2580	99.3297	86.5980	83.0929	71.7028	66.4432	76.2445	77.1551	89.9169	98.1513	106.5860	(45)
Energy content (annual)										Total = Sum(45)m =		1061.5372	(45)
Distribution loss (46)m = 0.15 x (45)m	16.5088	14.4387	14.8995	12.9897	12.4639	10.7554	9.9665	11.4367	11.5733	13.4875	14.7227	15.9879	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	37.8191	32.9171	35.0687	32.6065	32.3182	29.9448	30.9429	32.3182	32.6065	35.0687	35.2683	37.8191	(61)
Total heat required for water heating calculated for each month													
	147.8778	129.1751	134.3983	119.2046	115.4110	101.6476	97.3861	108.5627	109.7617	124.9856	133.4196	144.4051	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h													
	147.8778	129.1751	134.3983	119.2046	115.4110	101.6476	97.3861	108.5627	109.7617	124.9856	133.4196	144.4051	(64)
									Total per year (kWh/year) = Sum(64)m =			1466.2353	(64)
Heat gains from water heating, kWh/month													
	46.0493	40.2351	41.7943	36.9455	35.7079	31.3274	29.8281	33.4309	33.8057	38.6645	41.4524	44.8946	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	70.0383	70.0383	70.0383	70.0383	70.0383	70.0383	70.0383	70.0383	70.0383	70.0383	70.0383	70.0383	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	14.0137	12.4468	10.1224	7.6633	5.7284	4.8362	5.2257	6.7925	9.1169	11.5760	13.5109	14.4032	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	121.0056	122.2613	119.0971	112.3608	103.8575	95.8656	90.5265	89.2708	92.4351	99.1713	107.6746	115.6665	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.0038	30.0038	30.0038	30.0038	30.0038	30.0038	30.0038	30.0038	30.0038	30.0038	30.0038	30.0038	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-56.0306	-56.0306	-56.0306	-56.0306	-56.0306	-56.0306	-56.0306	-56.0306	-56.0306	-56.0306	-56.0306	-56.0306	(71)
Water heating gains (Table 5)													
	61.8942	59.8736	56.1751	51.3132	47.9945	43.5103	40.0915	44.9339	46.9524	51.9685	57.5728	60.3422	(72)
Total internal gains													
	243.9250	241.5932	232.4061	218.3488	204.5919	191.2235	182.8552	188.0088	195.5158	209.7273	225.7698	237.4234	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.0000	10.6334	0.6300	0.7000	0.7700	6.4994	(74)

Solar gains	6.4994	12.4207	21.1058	33.9013	45.6682	48.8892	45.6443	36.2129	25.3760	14.7852	8.0179	5.4182	(83)
Total gains	250.4244	254.0139	253.5119	252.2501	250.2601	240.1127	228.4994	224.2217	220.8918	224.5125	233.7876	242.8416	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.4254	68.6834	68.9381	70.1606	70.3941	71.5021	71.5021	71.7111	71.0712	70.3941	69.9233	69.4377	
alpha	5.5617	5.5789	5.5959	5.6774	5.6929	5.7668	5.7668	5.7807	5.7381	5.6929	5.6616	5.6292	
util living area													
	0.9975	0.9967	0.9945	0.9871	0.9602	0.8645	0.7041	0.7371	0.9207	0.9848	0.9954	0.9979	(86)
MIT	19.9725	20.0446	20.2026	20.4468	20.6965	20.9030	20.9777	20.9708	20.8418	20.5447	20.2308	19.9658	(87)
Th 2	20.0709	20.0741	20.0772	20.0918	20.0946	20.1074	20.1074	20.1098	20.1025	20.0946	20.0890	20.0833	(88)
util rest of house													
	0.9966	0.9956	0.9925	0.9816	0.9403	0.7963	0.5810	0.6195	0.8739	0.9770	0.9936	0.9972	(89)
MIT 2	18.6983	18.8059	19.0388	19.4040	19.7590	20.0301	20.0974	20.0953	19.9585	19.5482	19.0891	18.6975	(90)
Living area fraction									fLA = Living area / (4) =			0.4569	(91)
MIT	19.2805	19.3719	19.5705	19.8804	20.1873	20.4290	20.4996	20.4953	20.3621	20.0035	19.6107	19.2770	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2805	19.3719	19.5705	19.8804	20.1873	20.4290	20.4996	20.4953	20.3621	20.0035	19.6107	19.2770	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9956	0.9945	0.9910	0.9799	0.9428	0.8237	0.6379	0.6736	0.8897	0.9760	0.9924	0.9963	(94)
Useful gains	249.3341	252.6075	251.2405	247.1851	235.9338	197.7783	145.7507	151.0435	196.5237	219.1313	232.0000	241.9506	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	604.9511	582.2162	523.8953	432.4515	333.1544	225.2597	150.6995	157.8025	243.4660	369.1187	494.3932	599.9719	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	264.5791	221.4970	202.8552	133.3918	72.3321	0.0000	0.0000	0.0000	0.0000	111.5907	188.9231	266.3678	(98)
Space heating												1461.5368	(98)
Space heating per m2											(98) / (4) =	36.7313	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.4000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												1564.8146	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	264.5791	221.4970	202.8552	133.3918	72.3321	0.0000	0.0000	0.0000	0.0000	111.5907	188.9231	266.3678	(98)
Space heating efficiency (main heating system 1)													
	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)													
	283.2752	237.1489	217.1897	142.8178	77.4434	0.0000	0.0000	0.0000	0.0000	119.4761	202.2731	285.1904	(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													
	147.8778	129.1751	134.3983	119.2046	115.4110	101.6476	97.3861	108.5627	109.7617	124.9856	133.4196	144.4051	(64)
Efficiency of water heater												80.3000	(216)
(217)m	86.4993	86.3970	86.0851	85.3348	83.9120	80.3000	80.3000	80.3000	80.3000	84.7672	85.9266	86.5721	(217)
Fuel for water heating, kWh/month													
	170.9584	149.5134	156.1227	139.6905	137.5382	126.5848	121.2779	135.1964	136.6895	147.4456	155.2716	166.8034	(219)
Water heating fuel used												1743.0923	(219)
Annual totals kWh/year													
Space heating fuel - main system												1564.8146	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												247.4859	(232)
Total delivered energy for all uses												3630.3928	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1564.8146	0.2160	338.0000	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1743.0923	0.2160	376.5079	(264)
Space and water heating			714.5079	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	247.4859	0.5190	128.4452	(268)
Total CO2, kg/m2/year			881.8781	(272)
Emissions per m2 for space and water heating			17.9570	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			3.2281	(272b)
Emissions per m2 for pumps and fans			0.9783	(272c)
Target Carbon Dioxide Emission Rate (TER) = (17.9570 * 1.00) + 3.2281 + 0.9783, rounded to 2 d.p.			22.1600	(273)

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

Property Reference	Flat 12 - 1 Hampshire St.	**Issued on Date**	11/05/2020
Assessment Reference	AD - Gas Combi + PV	**Prop Type Ref**	
Property	Flat 12, 1 Hampshire Street, London, NW5 2TE		

SAP Rating	89 B	**DER**	12.43	**TER**	18.07
Environmental	91 B	**% DER<TER**	31.23		
CO_2 Emissions (t/year)	0.77	**DFEE**	42.01	**TFEE**	47.92
General Requirements Compliance	Pass	**% DFEE<TFEE**	12.33		

Assessor Details	Mr. Andrew Gwynne, Andrew Gwynne, Tel: 01636 653055, andrew.gwynne@mesenergyservices.co.uk	**Assessor ID**	P741-0001
Client			

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

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

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

Mid-floor flat, total floor area 87 m²

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

1a TER and DER
Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 18.07 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.43 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)47.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)42.0 kWh/m²/yrOK

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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	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.34 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated using user-specified y-value of 0.118

---
3 Air permeability
Air permeability at 50 pascals: 5.00 (design value)
Maximum 10.0 OK

---
4 Heating efficiency
Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
tbc tbc
Combi boiler
Efficiency: 89.0% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage No cylinder

---
6 Controls
Space heating controls: Time and temperature zone control OK

Hot water controls: No cylinder

Boiler interlock Yes OK

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

---
8 Mechanical ventilation
Not applicable

---
9 Summertime temperature
Overheating risk (Thames Valley): Not significant OK
Based on:
Overshading: Average
Windows facing North: 1.92 m², No overhang
Windows facing West: 2.40 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Roof U-value 0.11 W/m²K
Door U-value 1.00 W/m²K
Photovoltaic array 1.00 kW

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	87.0200 (1b)	x	2.4000 (2b)	=	208.8480	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.0200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	208.8480	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1436	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3936	(18)
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3641	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4643	0.4552	0.4460	0.4005	0.3914	0.3459	0.3459	0.3368	0.3641	0.3914	0.4096	0.4278	(22b)
Effective ac	0.6078	0.6036	0.5995	0.5802	0.5766	0.5598	0.5598	0.5567	0.5663	0.5766	0.5839	0.5915	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 1.40)			4.3200	1.3258	5.7273			(27)
Ext Door			2.3300	1.0000	2.3300			(26)
Glazed Door			10.0800	1.4000	14.1120			(26a)
External Wall 1	79.5400	16.7300	62.8100	0.1800	11.3058	0.0000	0.0000	(29a)
Flat Roof to Terrace	6.6200		6.6200	0.1100	0.7282	9.0000	59.5800	(30)
Total net area of external elements Aum(A, m2)			86.1600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.2033			(33)
Party Wall 1			33.1600	0.0000	0.0000	0.0000	0.0000	(32)
Party Floor 1			87.0200			0.0000	0.0000	(32d)
Party Ceilings 1			80.4000			0.0000	0.0000	(32b)
Stud Wall			169.4400			75.0000	12708.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12767.5800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		146.7201 (35)
Thermal bridges (User defined value 0.118 * total exposed area)		10.1669 (36)
Total fabric heat loss	(33) + (36) =	44.3702 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	41.8872	41.5988	41.3161	39.9882	39.7398	38.5833	38.5833	38.3691	39.0288	39.7398	40.2424	40.7678	(38)
Heat transfer coeff	86.2573	85.9689	85.6862	84.3584	84.1100	82.9535	82.9535	82.7393	83.3989	84.1100	84.6125	85.1380	(39)
Average = Sum(39)m / 12 =												84.3572	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9912	0.9879	0.9847	0.9694	0.9666	0.9533	0.9533	0.9508	0.9584	0.9666	0.9723	0.9784	(40)
HLP (average)												0.9694	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5827 (42)
Average daily hot water use (litres/day)		95.5390 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	105.0929	101.2713	97.4498	93.6282	89.8067	85.9851	85.9851	89.8067	93.6282	97.4498	101.2713	105.0929	(44)
Energy conte	155.8497	136.3072	140.6568	122.6280	117.6645	101.5355	94.0876	107.9669	109.2563	127.3277	138.9882	150.9322	(45)
Energy content (annual)										Total = Sum(45)m =		1503.2006	(45)
Distribution loss (46)m = 0.15 x (45)m	23.3775	20.4461	21.0985	18.3942	17.6497	15.2303	14.1131	16.1950	16.3885	19.0992	20.8482	22.6398	(46)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Water storage loss:
Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	50.9589	46.0274	49.6593	46.1728	45.7645	42.4036	43.8171	45.7645	46.1728	49.6593	49.3151	50.9589 (61)

Total heat required for water heating calculated for each month

	206.8086	182.3346	190.3161	168.8008	163.4290	143.9391	137.9046	153.7314	155.4292	176.9871	188.3032	201.8911 (62)
WWHRS	-35.8351	-31.5298	-32.1805	-26.4806	-24.5896	-20.2864	-17.1714	-20.7898	-21.3953	-26.4463	-30.6310	-34.6354 eq.(G10)

Total of WWHRS savings -321.9712

Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)

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

Output from w/h

	170.9736	150.8048	158.1357	142.3202	138.8394	123.6527	120.7333	132.9416	134.0339	150.5408	157.6722	167.2556 (64)

Total per year (kWh/year) = Sum(64)m = 1747.9037 (64)

Heat gains from water heating, kWh/month

	64.5598	56.8290	59.1832	52.3170	50.5646	44.3615	42.2384	47.3401	47.8709	54.7513	58.5423	62.9247 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	129.1347	129.1347	129.1347	129.1347	129.1347	129.1347	129.1347	129.1347	129.1347	129.1347	129.1347	129.1347	(66)

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

	27.0838	24.0556	19.5633	14.8107	11.0712	9.3468	10.0995	13.1277	17.6200	22.3726	26.1121	27.8366 (67)

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

	233.4873	235.9101	229.8046	216.8066	200.3990	184.9781	174.6760	172.2532	178.3587	191.3567	207.7643	223.1852 (68)

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

	35.9135	35.9135	35.9135	35.9135	35.9135	35.9135	35.9135	35.9135	35.9135	35.9135	35.9135	35.9135 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-103.3078	-103.3078	-103.3078	-103.3078	-103.3078	-103.3078	-103.3078	-103.3078	-103.3078	-103.3078	-103.3078	-103.3078 (71)

Water heating gains (Table 5)

	86.7739	84.5669	79.5473	72.6625	67.9631	61.6131	56.7720	63.6292	66.4874	73.5905	81.3088	84.5762 (72)

Total internal gains

	412.0854	409.2731	393.6557	369.0202	344.1737	320.6784	306.2880	313.7505	327.2065	352.0602	379.9257	400.3383 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.9200	10.6334	0.7600	0.7000	0.7700	7.5269	(74)
West	2.4000	19.6403	0.7600	0.7000	0.7700	17.3781	(80)

Solar gains	24.9051	48.3797	80.4280	120.9125	152.9551	159.0546	150.3840	125.7093	94.5013	57.4610	30.9539	20.5658 (83)
Total gains	436.9905	457.6528	474.0837	489.9327	497.1288	479.7331	456.6720	439.4598	421.7078	409.5212	410.8796	420.9041 (84)

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7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	41.1159	41.2539	41.3900	42.0415	42.1656	42.7535	42.7535	42.8642	42.5251	42.1656	41.9152	41.6565	
alpha	3.7411	3.7503	3.7593	3.8028	3.8110	3.8502	3.8502	3.8576	3.8350	3.8110	3.7943	3.7771	
util living area	0.9919	0.9894	0.9833	0.9671	0.9270	0.8320	0.6971	0.7336	0.8957	0.9697	0.9879	0.9930	(86)
MIT	19.6630	19.7572	19.9514	20.2378	20.5226	20.7625	20.8706	20.8559	20.6788	20.3250	19.9563	19.6524	(87)
Th 2	20.0906	20.0934	20.0961	20.1089	20.1113	20.1225	20.1225	20.1245	20.1182	20.1113	20.1065	20.1014	(88)
util rest of house	0.9903	0.9872	0.9795	0.9587	0.9051	0.7751	0.5932	0.6364	0.8560	0.9604	0.9850	0.9916	(89)
MIT 2	18.2754	18.4148	18.6997	19.1240	19.5304	19.8592	19.9800	19.9689	19.7532	19.2541	18.7153	18.2678	(90)
Living area fraction									fLA = Living area / (4) =			0.3372	(91)
MIT	18.7433	18.8674	19.1217	19.4996	19.8650	20.1638	20.2803	20.2680	20.0653	19.6151	19.1337	18.7346	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.5933	18.7174	18.9717	19.3496	19.7150	20.0138	20.1303	20.1180	19.9153	19.4651	18.9837	18.5846	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9866	0.9826	0.9732	0.9494	0.8930	0.7668	0.5942	0.6356	0.8447	0.9513	0.9799	0.9883	(94)
Useful gains	431.1235	449.7014	461.3950	465.1389	443.9594	367.8811	271.3719	279.3010	356.2001	389.5959	402.6229	415.9839	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1232.8994	1187.8691	1068.6525	881.5076	674.1376	449.0929	292.8487	307.6208	484.9921	745.6471	1005.5121	1224.6763	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	596.5213	496.0487	451.7996	299.7855	171.2525	0.0000	0.0000	0.0000	0.0000	264.9021	434.0802	601.6671	(98)

Space heating 3316.0570 (98)

Space heating per m2 (98) / (4) = 38.1068 (99)

8c. Space cooling requirement

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	89.9000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	3688.6062	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	596.5213	496.0487	451.7996	299.7855	171.2525	0.0000	0.0000	0.0000	0.0000	264.9021	434.0802	601.6671	(98)
Space heating efficiency (main heating system 1)													
	89.9000	89.9000	89.9000	89.9000	89.9000	0.0000	0.0000	0.0000	0.0000	89.9000	89.9000	89.9000	(210)
Space heating fuel (main heating system)													
	663.5387	551.7783	502.5579	333.4655	190.4922	0.0000	0.0000	0.0000	0.0000	294.6631	482.8479	669.2627	(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													
	170.9736	150.8048	158.1357	142.3202	138.8394	123.6527	120.7333	132.9416	134.0339	150.5408	157.6722	167.2556	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.4348	87.3233	87.0437	86.3805	85.0787	79.8000	79.8000	79.8000	79.8000	85.9577	86.9672	87.4913	(217)
Fuel for water heating, kWh/month													
	195.5441	172.6970	181.6738	164.7596	163.1893	154.9532	151.2948	166.5934	167.9623	175.1335	181.3009	191.1683	(219)
Water heating fuel used												2066.2703	(219)
Annual totals kWh/year													
Space heating fuel - main system												3688.6062	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												478.3088	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.00 * 1080 * 1.00) =										-863.6197		-863.6197	(233)
Total delivered energy for all uses												5444.5657	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3688.6062	0.2160	796.7389	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2066.2703	0.2160	446.3144	(264)
Space and water heating			1243.0533	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	478.3088	0.5190	248.2423	(268)
Energy saving/generation technologies				
PV Unit	-863.6197	0.5190	-448.2186	(269)
Total CO2, kg/year			1082.0020	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			12.4300	(273)

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

DER		12.4300	ZC1
Total Floor Area	TFA	87.0200	
Assumed number of occupants	N	2.5827	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		15.8998	ZC2
CO2 emissions from cooking, equation (L16)		2.0798	ZC3
Total CO2 emissions		30.4096	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		30.4096	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	87.0200 (1b)	x	2.4000 (2b)	=	208.8480	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.0200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	208.8480	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1436	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3936	(18)
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3641	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4643	0.4552	0.4460	0.4005	0.3914	0.3459	0.3459	0.3368	0.3641	0.3914	0.4096	0.4278	(22b)
Effective ac	0.6078	0.6036	0.5995	0.5802	0.5766	0.5598	0.5598	0.5567	0.5663	0.5766	0.5839	0.5915	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.3300	1.0000	2.3300			(26)
TER Semi-glazed door			10.0800	1.2000	12.0960			(26a)
TER Opening Type (Uw = 1.40)			4.3200	1.3258	5.7273			(27)
External Wall 1	79.5400	16.7300	62.8100	0.1800	11.3058			(29a)
Flat Roof to Terrace	6.6200		6.6200	0.1300	0.8606			(30)
Total net area of external elements Aum(A, m2)			86.1600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.3197			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.5676	(36)
Total fabric heat loss					(33) + (36) =		40.8873	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	41.8872	41.5988	41.3161	39.9882	39.7398	38.5833	38.5833	38.3691	39.0288	39.7398	40.2424	40.7678	(38)
Heat transfer coeff	82.7744	82.4860	82.2033	80.8755	80.6271	79.4706	79.4706	79.2564	79.9160	80.6271	81.1297	81.6551	(39)
Average = Sum(39)m / 12 =												80.8743	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9512	0.9479	0.9446	0.9294	0.9265	0.9132	0.9132	0.9108	0.9184	0.9265	0.9323	0.9383	(40)
HLP (average)												0.9294	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5827	(42)
Average daily hot water use (litres/day)	95.5390	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	105.0929	101.2713	97.4498	93.6282	89.8067	85.9851	85.9851	89.8067	93.6282	97.4498	101.2713	105.0929	(44)
Energy conte	155.8497	136.3072	140.6568	122.6280	117.6645	101.5355	94.0876	107.9669	109.2563	127.3277	138.9882	150.9322	(45)
Energy content (annual)										Total = Sum(45)m =		1503.2006	(45)
Distribution loss (46)m = 0.15 x (45)m	23.3775	20.4461	21.0985	18.3942	17.6497	15.2303	14.1131	16.1950	16.3885	19.0992	20.8482	22.6398	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	50.9589	46.0274	49.6593	46.1728	45.7645	42.4036	43.8171	45.7645	46.1728	49.6593	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	206.8086	182.3346	190.3161	168.8008	163.4290	143.9391	137.9046	153.7314	155.4292	176.9871	188.3032	201.8911	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h													
	206.8086	182.3346	190.3161	168.8008	163.4290	143.9391	137.9046	153.7314	155.4292	176.9871	188.3032	201.8911	(64)
									Total per year (kWh/year) = Sum(64)m =			2069.8748	(64)
Heat gains from water heating, kWh/month													
	64.5598	56.8290	59.1832	52.3170	50.5646	44.3615	42.2384	47.3401	47.8709	54.7513	58.5423	62.9247	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	129.1347	129.1347	129.1347	129.1347	129.1347	129.1347	129.1347	129.1347	129.1347	129.1347	129.1347	129.1347	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.0838	24.0556	19.5633	14.8107	11.0712	9.3468	10.0995	13.1277	17.6200	22.3726	26.1121	27.8366	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	233.4873	235.9101	229.8046	216.8066	200.3990	184.9781	174.6760	172.2532	178.3587	191.3567	207.7643	223.1852	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.9135	35.9135	35.9135	35.9135	35.9135	35.9135	35.9135	35.9135	35.9135	35.9135	35.9135	35.9135	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.3078	-103.3078	-103.3078	-103.3078	-103.3078	-103.3078	-103.3078	-103.3078	-103.3078	-103.3078	-103.3078	-103.3078	(71)
Water heating gains (Table 5)													
	86.7739	84.5669	79.5473	72.6625	67.9631	61.6131	56.7720	63.6292	66.4874	73.5905	81.3088	84.5762	(72)
Total internal gains													
	412.0854	409.2731	393.6557	369.0202	344.1737	320.6784	306.2880	313.7505	327.2065	352.0602	379.9257	400.3383	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.9200	10.6334	0.6300	0.7000	0.7700	6.2394	(74)
West	2.4000	19.6403	0.6300	0.7000	0.7700	14.4056	(80)

Solar gains	20.6450	40.1042	66.6706	100.2301	126.7917	131.8479	124.6604	104.2064	78.3366	47.6322	25.6592	17.0479	(83)
Total gains	432.7304	449.3773	460.3263	469.2503	470.9654	452.5263	430.9484	417.9569	405.5431	399.6924	405.5849	417.3863	(84)

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7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.0063	73.2616	73.5135	74.7205	74.9507	76.0414	76.0414	76.2469	75.6175	74.9507	74.4864	74.0071	
alpha	5.8671	5.8841	5.9009	5.9814	5.9967	6.0694	6.0694	6.0831	6.0412	5.9967	5.9658	5.9338	
util living area													
	0.9992	0.9989	0.9978	0.9935	0.9762	0.9035	0.7556	0.7940	0.9533	0.9938	0.9986	0.9994	(86)
MIT	19.9363	20.0149	20.1786	20.4239	20.6737	20.8875	20.9729	20.9631	20.8143	20.5035	20.1878	19.9284	(87)
Th 2	20.1242	20.1270	20.1297	20.1426	20.1450	20.1563	20.1563	20.1583	20.1519	20.1450	20.1401	20.1350	(88)
util rest of house													
	0.9990	0.9985	0.9969	0.9907	0.9634	0.8478	0.6374	0.6840	0.9216	0.9904	0.9980	0.9992	(89)
MIT 2	18.6849	18.8021	19.0434	19.4107	19.7707	20.0606	20.1432	20.1385	19.9705	19.5292	19.0650	18.6814	(90)
Living area fraction									fLA = Living area / (4) =			0.3372	(91)
MIT	19.1068	19.2110	19.4262	19.7523	20.0751	20.3394	20.4229	20.4165	20.2550	19.8577	19.4436	19.1019	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1068	19.2110	19.4262	19.7523	20.0751	20.3394	20.4229	20.4165	20.2550	19.8577	19.4436	19.1019	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9986	0.9979	0.9959	0.9889	0.9621	0.8619	0.6778	0.7211	0.9264	0.9889	0.9973	0.9989	(94)
Useful gains	432.1071	448.4288	458.4466	464.0243	453.1096	390.0378	292.0803	301.3923	375.6936	395.2501	404.4843	416.9065	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1225.6278	1180.4572	1062.5729	877.6876	675.2634	456.1128	303.8104	318.3366	491.8850	746.4222	1001.4305	1216.8126	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	590.3794	491.9231	449.4700	297.8376	165.2824	0.0000	0.0000	0.0000	0.0000	261.2720	429.8012	595.1301	(98)
Space heating												3281.0958	(98)
Space heating per m2											(98) / (4) =	37.7051	(99)

8c. Space cooling requirement

Not applicable

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

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.4000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												3512.9506	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	590.3794	491.9231	449.4700	297.8376	165.2824	0.0000	0.0000	0.0000	0.0000	261.2720	429.8012	595.1301	(98)
Space heating efficiency (main heating system 1)													
	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)													
	632.0978	526.6843	481.2312	318.8839	176.9619	0.0000	0.0000	0.0000	0.0000	279.7345	460.1726	637.1843	(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													
	206.8086	182.3346	190.3161	168.8008	163.4290	143.9391	137.9046	153.7314	155.4292	176.9871	188.3032	201.8911	(64)
Efficiency of water heater												80.3000	(216)
(217)m	87.5435	87.4263	87.1397	86.4659	85.0796	80.3000	80.3000	80.3000	80.3000	86.0301	87.0639	87.6087	(217)
Fuel for water heating, kWh/month													
	236.2354	208.5579	218.4036	195.2224	192.0895	179.2517	171.7368	191.4463	193.5606	205.7268	216.2817	230.4463	(219)
Water heating fuel used												2438.9589	(219)
Annual totals kWh/year													
Space heating fuel - main system												3512.9506	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												478.3088	(232)
Total delivered energy for all uses												6505.2183	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3512.9506	0.2160	758.7973	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2438.9589	0.2160	526.8151	(264)
Space and water heating			1285.6125	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	478.3088	0.5190	248.2423	(268)
Total CO2, kg/m2/year			1572.7797	(272)
Emissions per m2 for space and water heating			14.7738	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.8527	(272b)
Emissions per m2 for pumps and fans			0.4473	(272c)
Target Carbon Dioxide Emission Rate (TER) = (14.7738 * 1.00) + 2.8527 + 0.4473, rounded to 2 d.p.			18.0700	(273)

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

Property Reference	Flat 13 - 1 Hampshire St.	**Issued on Date**	11/05/2020
Assessment Reference	AD - Gas Combi + PV	**Prop Type Ref**	
Property	Flat 13, 1 Hampshire Street, London, NW5 2TE		

SAP Rating	88 B	**DER**	13.61	**TER**	20.14
Environmental	90 B	**% DER<TER**	32.42		
CO_2 Emissions (t/year)	0.84	**DFEE**	47.88	**TFEE**	57.91
General Requirements Compliance	Pass	**% DFEE<TFEE**	17.32		

Assessor Details	Mr. Andrew Gwynne, Andrew Gwynne, Tel: 01636 653055, andrew.gwynne@mesenergyservices.co.uk	**Assessor ID**	P741-0001
Client			

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

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

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

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DWELLING AS DESIGNED

Top-floor flat, total floor area 84 m²

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

1a TER and DER
Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 20.14 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.61 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)57.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)47.9 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	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.35 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated using user-specified y-value of 0.060

---

3 Air permeability
Air permeability at 50 pascals: 5.00 (design value)
Maximum 10.0 OK

---

4 Heating efficiency
Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
tbc tbc
Combi boiler
Efficiency: 89.0% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

---

5 Cylinder insulation
Hot water storage No cylinder

---

6 Controls
Space heating controls: Time and temperature zone control OK

Hot water controls: No cylinder

Boiler interlock Yes OK

---

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

---

8 Mechanical ventilation
Not applicable

---

9 Summertime temperature
Overheating risk (Thames Valley): Not significant OK
Based on:
Overshading: Average
Windows facing North: 2.38 m², No overhang
Windows facing East: 2.38 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

---

10 Key features
Party wall U-value 0.00 W/m²K
Roof U-value 0.11 W/m²K
Door U-value 1.00 W/m²K
Photovoltaic array 1.00 kW

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	83.9300 (1b)	x	2.3800 (2b)	=	199.7534	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.9300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	199.7534	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1001	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3501	(18)
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3239	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4129	0.4048	0.3967	0.3563	0.3482	0.3077	0.3077	0.2996	0.3239	0.3482	0.3643	0.3805	(22b)
Effective ac	0.5853	0.5819	0.5787	0.5635	0.5606	0.5473	0.5473	0.5449	0.5524	0.5606	0.5664	0.5724	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 1.40)			4.7600	1.3258	6.3106			(27)
Ext Door			2.3100	1.0000	2.3100			(26)
Glazed Door			10.4200	1.4000	14.5880			(26a)
External Wall 1	79.5600	17.4900	62.0700	0.1800	11.1726	0.0000	0.0000	(29a)
Flat Roof - To Terrace	83.8300		83.8300	0.1100	9.2213	9.0000	754.4700	(30)
Total net area of external elements Aum(A, m2)			163.3900					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.6025			(33)
Party Wall 1			25.7300	0.0000	0.0000	0.0000	0.0000	(32)
Party Floor 1			83.8300			0.0000	0.0000	(32d)
Stud Wall			123.0500			75.0000	9228.7500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9983.2200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		118.9470 (35)
Thermal bridges (User defined value 0.060 * total exposed area)		9.8034 (36)
Total fabric heat loss	(33) + (36) =	53.4059 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	38.5792	38.3609	38.1470	37.1423	36.9543	36.0793	36.0793	35.9172	36.4163	36.9543	37.3346	37.7322	(38)
Heat transfer coeff	91.9851	91.7668	91.5529	90.5482	90.3603	89.4852	89.4852	89.3231	89.8223	90.3603	90.7405	91.1381	(39)
Average = Sum(39)m / 12 =												90.5473	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0960	1.0934	1.0908	1.0789	1.0766	1.0662	1.0662	1.0643	1.0702	1.0766	1.0811	1.0859	(40)
HLP (average)												1.0788	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5332 (42)
Average daily hot water use (litres/day)		94.3638 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.8002	100.0256	96.2511	92.4765	88.7020	84.9274	84.9274	88.7020	92.4765	96.2511	100.0256	103.8002	(44)
Energy conte	153.9327	134.6305	138.9266	121.1196	116.2171	100.2866	92.9302	106.6388	107.9124	125.7615	137.2785	149.0756	(45)
Energy content (annual)										Total = Sum(45)m =		1484.7103	(45)
Distribution loss (46)m = 0.15 x (45)m	23.0899	20.1946	20.8390	18.1679	17.4326	15.0430	13.9395	15.9958	16.1869	18.8642	20.5918	22.3613	(46)
Water storage loss:													

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	50.9589	46.0274	49.0485	45.6049	45.2016	41.8820	43.2781	45.2016	45.6049	49.0485	49.3151	50.9589	(61)

Total heat required for water heating calculated for each month

	204.8916	180.6579	187.9751	166.7245	161.4187	142.1686	136.2083	151.8404	153.5173	174.8100	186.5936	200.0345	(62)
WWHRS	-33.3916	-29.3795	-29.9860	-24.6767	-22.9154	-18.9059	-16.0041	-19.3761	-19.9398	-24.6460	-28.5440	-32.2733	eq.(G10)

Total of WWHRS savings -300.0385

Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)

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

Output from w/h

	171.5000	151.2784	157.9891	142.0478	138.5033	123.2627	120.2043	132.4643	133.5775	150.1641	158.0496	167.7612	(64)

Total per year (kWh/year) = Sum(64)m = 1746.8021 (64)

Heat gains from water heating, kWh/month

	63.9223	56.2715	58.4552	51.6735	49.9426	43.8158	41.7188	46.7578	47.2821	54.0778	57.9739	62.3074	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	126.6607	126.6607	126.6607	126.6607	126.6607	126.6607	126.6607	126.6607	126.6607	126.6607	126.6607	126.6607	(66)

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

	25.9085	23.0117	18.7144	14.1680	10.5908	8.9412	9.6612	12.5580	16.8554	21.4018	24.9790	26.6286	(67)

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

	227.4578	229.8181	223.8703	211.2079	195.2240	180.2014	170.1653	167.8050	173.7529	186.4152	202.3992	217.4218	(68)

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

	35.6661	35.6661	35.6661	35.6661	35.6661	35.6661	35.6661	35.6661	35.6661	35.6661	35.6661	35.6661	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-101.3285	-101.3285	-101.3285	-101.3285	-101.3285	-101.3285	-101.3285	-101.3285	-101.3285	-101.3285	-101.3285	-101.3285	(71)

Water heating gains (Table 5)

	85.9171	83.7373	78.5689	71.7687	67.1271	60.8553	56.0737	62.8465	65.6696	72.6853	80.5193	83.7465	(72)

Total internal gains

	403.2817	400.5654	385.1517	361.1429	336.9401	313.9960	299.8985	307.2078	320.2761	344.5005	371.8957	391.7951	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.3800	10.6334	0.7600	0.7000	0.7700	9.3303	(74)
East	2.3800	19.6403	0.7600	0.7000	0.7700	17.2333	(76)

Solar gains	26.5636	51.5426	85.8175	129.6383	164.7923	171.7658	162.2358	135.0589	100.9995	61.2272	32.9980	21.9500	(83)
Total gains	429.8453	452.1081	470.9692	490.7812	501.7324	485.7618	462.1342	442.2666	421.2756	405.7277	404.8937	413.7451	(84)

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7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.1475	30.2192	30.2898	30.6259	30.6896	30.9897	30.9897	31.0459	30.8734	30.6896	30.5609	30.4276	
alpha	3.0098	3.0146	3.0193	3.0417	3.0460	3.0660	3.0660	3.0697	3.0582	3.0460	3.0374	3.0285	
util living area	0.9843	0.9803	0.9713	0.9501	0.9044	0.8122	0.6908	0.7259	0.8757	0.9545	0.9783	0.9861	(86)
MIT	19.2882	19.4019	19.6406	19.9892	20.3447	20.6501	20.8026	20.7800	20.5433	20.1014	19.6443	19.2688	(87)
Th 2	20.0041	20.0062	20.0083	20.0181	20.0200	20.0285	20.0285	20.0301	20.0252	20.0200	20.0163	20.0124	(88)
util rest of house	0.9816	0.9767	0.9657	0.9390	0.8795	0.7541	0.5855	0.6280	0.8336	0.9423	0.9737	0.9836	(89)
MIT 2	17.6900	17.8571	18.2058	18.7168	19.2235	19.6425	19.8219	19.8014	19.5066	18.8834	18.2182	17.6674	(90)

Living area fraction fLA = Living area / (4) = 0.3921 (91)

MIT	18.3167	18.4628	18.7684	19.2157	19.6631	20.0376	20.2064	20.1851	19.9131	19.3610	18.7774	18.2953	(92)

Temperature adjustment -0.1500

adjusted MIT	18.1667	18.3128	18.6184	19.0657	19.5131	19.8876	20.0564	20.0351	19.7631	19.2110	18.6274	18.1453	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9746	0.9685	0.9553	0.9252	0.8635	0.7441	0.5890	0.6286	0.8195	0.9291	0.9649	0.9772	(94)
Useful gains	418.9150	437.8833	449.9036	454.0645	433.2418	361.4345	272.1821	277.9896	345.2189	376.9459	390.6944	404.3184	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1275.5256	1230.8548	1109.4746	920.4885	705.9976	473.1579	309.3003	324.6995	508.6751	778.0920	1046.0002	1270.9470	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	637.3183	532.8768	490.7208	335.8253	202.9303	0.0000	0.0000	0.0000	0.0000	298.4527	471.8202	644.7716	(98)

Space heating 3614.7160 (98)

Space heating per m2 (98) / (4) = 43.0682 (99)

8c. Space cooling requirement

Not applicable

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	89.9000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	4020.8187	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	637.3183	532.8768	490.7208	335.8253	202.9303	0.0000	0.0000	0.0000	0.0000	298.4527	471.8202	644.7716	(98)
Space heating efficiency (main heating system 1)													
	89.9000	89.9000	89.9000	89.9000	89.9000	0.0000	0.0000	0.0000	0.0000	89.9000	89.9000	89.9000	(210)
Space heating fuel (main heating system)													
	708.9191	592.7440	545.8518	373.5543	225.7289	0.0000	0.0000	0.0000	0.0000	331.9829	524.8278	717.2098	(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													
	171.5000	151.2784	157.9891	142.0478	138.5033	123.2627	120.2043	132.4643	133.5775	150.1641	158.0496	167.7612	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.5504	87.4526	87.2117	86.6404	85.5098	79.8000	79.8000	79.8000	79.8000	86.2462	87.1328	87.6106	(217)
Fuel for water heating, kWh/month													
	195.8872	172.9834	181.1557	163.9509	161.9737	154.4645	150.6319	165.9953	167.3903	174.1110	181.3893	191.4851	(219)
Water heating fuel used												2061.4183	(219)
Annual totals kWh/year													
Space heating fuel - main system												4020.8187	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												457.5529	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.00 * 1080 * 1.00) =										-863.6197		-863.6197	(233)
Total delivered energy for all uses												5751.1702	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4020.8187	0.2160	868.4968	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2061.4183	0.2160	445.2664	(264)
Space and water heating			1313.7632	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	457.5529	0.5190	237.4700	(268)
Energy saving/generation technologies				
PV Unit	-863.6197	0.5190	-448.2186	(269)
Total CO2, kg/year			1141.9395	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.6100	(273)

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

DER		13.6100	ZC1
Total Floor Area	TFA	83.9300	
Assumed number of occupants	N	2.5332	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.0594	ZC2
CO2 emissions from cooking, equation (L16)		2.1422	ZC3
Total CO2 emissions		31.8117	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		31.8117	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	83.9300 (1b)	x	2.3800 (2b)	=	199.7534	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.9300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	199.7534	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1502	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4002	(18)
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3702	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4720	0.4627	0.4535	0.4072	0.3979	0.3517	0.3517	0.3424	0.3702	0.3979	0.4164	0.4350	(22b)
Effective ac	0.6114	0.6071	0.6028	0.5829	0.5792	0.5618	0.5618	0.5586	0.5685	0.5792	0.5867	0.5946	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.3100	1.0000	2.3100			(26)
TER Semi-glazed door			10.4200	1.2000	12.5040			(26a)
TER Opening Type (Uw = 1.40)			4.7600	1.3258	6.3106			(27)
External Wall 1	79.5600	17.4900	62.0700	0.1800	11.1726			(29a)
Flat Roof - To Terrace	83.8300		83.8300	0.1300	10.8979			(30)
Total net area of external elements Aum(A, m2)			163.3900					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.1951			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.6332	(36)
Total fabric heat loss						(33) + (36) =	51.8283	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.3011	40.0160	39.7366	38.4240	38.1785	37.0353	37.0353	36.8236	37.4756	38.1785	38.6753	39.1946	(38)
Heat transfer coeff	92.1294	91.8443	91.5649	90.2524	90.0068	88.8636	88.8636	88.6519	89.3039	90.0068	90.5036	91.0229	(39)
Average = Sum(39)m / 12 =												90.2512	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0977	1.0943	1.0910	1.0753	1.0724	1.0588	1.0588	1.0563	1.0640	1.0724	1.0783	1.0845	(40)
HLP (average)												1.0753	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5332	(42)
Average daily hot water use (litres/day)												94.3638	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.8002	100.0256	96.2511	92.4765	88.7020	84.9274	84.9274	88.7020	92.4765	96.2511	100.0256	103.8002	(44)
Energy conte	153.9327	134.6305	138.9266	121.1196	116.2171	100.2866	92.9302	106.6388	107.9124	125.7615	137.2785	149.0756	(45)
Energy content (annual)										Total = Sum(45)m =		1484.7103	(45)
Distribution loss (46)m = 0.15 x (45)m	23.0899	20.1946	20.8390	18.1679	17.4326	15.0430	13.9395	15.9958	16.1869	18.8642	20.5918	22.3613	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	50.9589	46.0274	49.0485	45.6049	45.2016	41.8820	43.2781	45.2016	45.6049	49.0485	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	204.8916	180.6579	187.9751	166.7245	161.4187	142.1686	136.2083	151.8404	153.5173	174.8100	186.5936	200.0345	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h													
	204.8916	180.6579	187.9751	166.7245	161.4187	142.1686	136.2083	151.8404	153.5173	174.8100	186.5936	200.0345	(64)
									Total per year (kWh/year) = Sum(64)m =			2046.8405	(64)
Heat gains from water heating, kWh/month													
	63.9223	56.2715	58.4552	51.6735	49.9426	43.8158	41.7188	46.7578	47.2821	54.0778	57.9739	62.3074	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	126.6607	126.6607	126.6607	126.6607	126.6607	126.6607	126.6607	126.6607	126.6607	126.6607	126.6607	126.6607	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	25.9085	23.0117	18.7144	14.1680	10.5908	8.9412	9.6612	12.5580	16.8554	21.4018	24.9790	26.6286	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	227.4578	229.8181	223.8703	211.2079	195.2240	180.2014	170.1653	167.8050	173.7529	186.4152	202.3992	217.4218	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.6661	35.6661	35.6661	35.6661	35.6661	35.6661	35.6661	35.6661	35.6661	35.6661	35.6661	35.6661	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-101.3285	-101.3285	-101.3285	-101.3285	-101.3285	-101.3285	-101.3285	-101.3285	-101.3285	-101.3285	-101.3285	-101.3285	(71)
Water heating gains (Table 5)													
	85.9171	83.7373	78.5689	71.7687	67.1271	60.8553	56.0737	62.8465	65.6696	72.6853	80.5193	83.7465	(72)
Total internal gains													
	403.2817	400.5654	385.1517	361.1429	336.9401	313.9960	299.8985	307.2078	320.2761	344.5005	371.8957	391.7951	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.3800	10.6334	0.6300	0.7000	0.7700	7.7343	(74)
East	2.3800	19.6403	0.6300	0.7000	0.7700	14.2855	(76)

Solar gains	22.0198	42.7261	71.1382	107.4633	136.6041	142.3848	134.4849	111.9567	83.7233	50.7541	27.3536	18.1954	(83)
Total gains	425.3015	443.2916	456.2899	468.6062	473.5442	456.3808	434.3834	419.1644	403.9993	395.2546	399.2493	409.9905	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	63.2639	63.4603	63.6540	64.5797	64.7559	65.5890	65.5890	65.7456	65.2656	64.7559	64.4005	64.0330	
alpha	5.2176	5.2307	5.2436	5.3053	5.3171	5.3726	5.3726	5.3830	5.3510	5.3171	5.2934	5.2689	
util living area													
	0.9991	0.9987	0.9976	0.9936	0.9784	0.9197	0.7956	0.8315	0.9614	0.9941	0.9984	0.9993	(86)
MIT	19.7419	19.8289	20.0131	20.2893	20.5758	20.8305	20.9483	20.9325	20.7410	20.3835	20.0257	19.7322	(87)
Th 2	20.0027	20.0055	20.0082	20.0210	20.0234	20.0346	20.0346	20.0367	20.0303	20.0234	20.0186	20.0135	(88)
util rest of house													
	0.9988	0.9983	0.9966	0.9906	0.9660	0.8659	0.6676	0.7160	0.9321	0.9907	0.9978	0.9990	(89)
MIT 2	18.3118	18.4411	18.7124	19.1246	19.5385	19.8884	20.0092	19.9995	19.7755	19.2644	18.7386	18.3054	(90)
Living area fraction									fLA = Living area / (4) =			0.3921	(91)
MIT	18.8726	18.9853	19.2224	19.5813	19.9452	20.2578	20.3775	20.3654	20.1541	19.7032	19.2432	18.8649	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8726	18.9853	19.2224	19.5813	19.9452	20.2578	20.3775	20.3654	20.1541	19.7032	19.2432	18.8649	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9983	0.9976	0.9955	0.9887	0.9647	0.8809	0.7183	0.7609	0.9369	0.9892	0.9970	0.9986	(94)
Useful gains	424.5791	442.2149	454.2474	463.3061	456.8447	402.0086	312.0035	318.9359	378.5182	390.9702	398.0521	409.4248	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1342.5625	1293.6535	1164.9280	964.0136	742.1268	502.7706	335.6794	351.5387	540.6571	819.3509	1099.0071	1334.8385	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	682.9797	572.1667	528.7464	360.5094	212.2499	0.0000	0.0000	0.0000	0.0000	318.7153	504.6875	688.5078	(98)
Space heating												3868.5626	(98)
Space heating per m2											(98) / (4) =	46.0927	(99)

8c. Space cooling requirement

Not applicable

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

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	93.4000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	4141.9300	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	682.9797	572.1667	528.7464	360.5094	212.2499	0.0000	0.0000	0.0000	0.0000	318.7153	504.6875	688.5078	(98)
Space heating efficiency (main heating system 1)													
	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)													
	731.2416	612.5982	566.1096	385.9844	227.2483	0.0000	0.0000	0.0000	0.0000	341.2369	540.3507	737.1603	(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													
	204.8916	180.6579	187.9751	166.7245	161.4187	142.1686	136.2083	151.8404	153.5173	174.8100	186.5936	200.0345	(64)
Efficiency of water heater												80.3000	(216)
(217)m	87.8501	87.7514	87.5131	86.9420	85.7413	80.3000	80.3000	80.3000	80.3000	86.5443	87.4316	87.9107	(217)
Fuel for water heating, kWh/month													
	233.2286	205.8748	214.7965	191.7653	188.2625	177.0468	169.6243	189.0914	191.1797	201.9890	213.4166	227.5428	(219)
Water heating fuel used												2403.8182	(219)
Annual totals kWh/year													
Space heating fuel - main system												4141.9300	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												457.5529	(232)
Total delivered energy for all uses												7078.3011	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4141.9300	0.2160	894.6569	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2403.8182	0.2160	519.2247	(264)
Space and water heating			1413.8816	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	457.5529	0.5190	237.4700	(268)
Total CO2, kg/m2/year			1690.2766	(272)
Emissions per m2 for space and water heating			16.8460	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.8294	(272b)
Emissions per m2 for pumps and fans			0.4638	(272c)
Target Carbon Dioxide Emission Rate (TER) = (16.8460 * 1.00) + 2.8294 + 0.4638, rounded to 2 d.p.			20.1400	(273)

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

Property Reference	Flat 14 - 1 Hampshire St.	**Issued on Date**	11/05/2020
Assessment Reference	AD - Gas Combi + PV	**Prop Type Ref**	
Property	Flat 14, 1 Hampshire Street, London, NW5 2TE		

SAP Rating	89 B	**DER**	12.49	**TER**	20.23
Environmental	92 A	**% DER<TER**	38.26		
CO_2 Emissions (t/year)	0.60	**DFEE**	44.01	**TFEE**	53.99
General Requirements Compliance	Pass	**% DFEE<TFEE**	18.49		

Assessor Details	Mr. Andrew Gwynne, Andrew Gwynne, Tel: 01636 653055, andrew.gwynne@mesenergyservices.co.uk	**Assessor ID**	P741-0001
Client			

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

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

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

Top-floor flat, total floor area 69 m²

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

1a TER and DER
Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 20.23 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.49 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)54.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)44.0 kWh/m²/yrOK

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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	0.13 (max. 0.25)	0.13 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.34 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated using user-specified y-value of 0.055

---
3 Air permeability
Air permeability at 50 pascals: 5.00 (design value)
Maximum 10.0 OK

---
4 Heating efficiency
Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
tbc tbc
Combi boiler
Efficiency: 89.0% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage No cylinder

---
6 Controls
Space heating controls: Time and temperature zone control OK

Hot water controls: No cylinder

Boiler interlock Yes OK

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

---
8 Mechanical ventilation
Not applicable

---
9 Summertime temperature
Overheating risk (Thames Valley): Not significant OK
Based on:
Overshading: Average
Windows facing North: 4.76 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Roof U-value 0.11 W/m²K
Door U-value 1.00 W/m²K
Photovoltaic array 1.00 kW

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	68.7500 (1b)	x	2.3800 (2b)	=	163.6250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.7500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	163.6250	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1222	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3722	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3164	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4034	0.3955	0.3876	0.3480	0.3401	0.3006	0.3006	0.2927	0.3164	0.3401	0.3559	0.3718	(22b)
Effective ac	0.5814	0.5782	0.5751	0.5606	0.5578	0.5452	0.5452	0.5428	0.5501	0.5578	0.5633	0.5691	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 1.40)			4.7600	1.3258	6.3106			(27)
Ext Door			2.3100	1.0000	2.3100			(26)
Glazed Door			9.1200	1.4000	12.7680			(26a)
Exposed Floor			8.5000	0.1300	1.1050			(28b)
External Wall 1	29.7200	16.1900	13.5300	0.1800	2.4354	0.0000	0.0000	(29a)
Wall to Corridor	7.7500		7.7500	0.1671	1.2948	0.0000	0.0000	(29a)
Flat Roof - To Terrace	68.7500		68.7500	0.1100	7.5625	9.0000	618.7500	(30)
Total net area of external elements Aum(A, m2)			114.7200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.7863			(33)
Party Wall 1			45.9100	0.0000	0.0000	0.0000	0.0000	(32)
Party Wall			60.2500			0.0000	0.0000	(32d)
Stud Wall			128.5200			75.0000	9639.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10257.7500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		149.2036 (35)
Thermal bridges (User defined value 0.055 * total exposed area)		6.3096 (36)
Total fabric heat loss	(33) + (36) =	40.0959 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.3917	31.2211	31.0538	30.2684	30.1214	29.4373	29.4373	29.3106	29.7008	30.1214	30.4187	30.7295	(38)
Heat transfer coeff	71.4876	71.3170	71.1497	70.3643	70.2173	69.5332	69.5332	69.4065	69.7967	70.2173	70.5146	70.8254	(39)
Average = Sum(39)m / 12 =												70.3636	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0398	1.0373	1.0349	1.0235	1.0213	1.0114	1.0114	1.0095	1.0152	1.0213	1.0257	1.0302	(40)
HLP (average)												1.0235	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2154 (42)
Average daily hot water use (litres/day)	86.8157 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.4973	92.0247	88.5520	85.0794	81.6068	78.1341	78.1341	81.6068	85.0794	88.5520	92.0247	95.4973	(44)
Energy conte	141.6197	123.8615	127.8140	111.4313	106.9210	92.2647	85.4968	98.1088	99.2806	115.7019	126.2977	137.1511	(45)
Energy content (annual)											Total = Sum(45)m =	1365.9493	(45)

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

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	21.2430	18.5792	19.1721	16.7147	16.0382	13.8397	12.8245	14.7163	14.8921	17.3553	18.9447	20.5727	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	48.6644	42.3566	45.1251	41.9570	41.5859	38.5319	39.8163	41.5859	41.9570	45.1251	45.3820	48.6644	(61)
Total heat required for water heating calculated for each month													
	190.2841	166.2181	172.9391	153.3883	148.5069	130.7966	125.3131	139.6948	141.2375	160.8271	171.6797	185.8155	(62)
WWHRS	-29.8111	-26.2275	-26.7699	-22.0419	-20.4749	-16.8968	-14.3112	-17.3239	-17.8244	-22.0227	-25.4941	-28.8101	eq.(G10)
Total of WWHRS savings												-268.0086	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h													
	160.4730	139.9906	146.1692	131.3464	128.0320	113.8998	111.0019	122.3709	123.4132	138.8044	146.1856	157.0054	(64)
								Total per year (kWh/year) = Sum(64)m =				1618.6923	(64)
Heat gains from water heating, kWh/month													
	59.2547	51.7731	53.7794	47.5402	45.9477	40.3110	38.3818	43.0177	43.5000	49.7522	53.3395	57.7688	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	110.7699	110.7699	110.7699	110.7699	110.7699	110.7699	110.7699	110.7699	110.7699	110.7699	110.7699	110.7699	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	21.4590	19.0597	15.5004	11.7348	8.7719	7.4056	8.0020	10.4013	13.9606	17.7262	20.6891	22.0554	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	194.3622	196.3791	191.2966	180.4767	166.8185	153.9817	145.4059	143.3890	148.4715	159.2914	172.9496	185.7864	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.0770	34.0770	34.0770	34.0770	34.0770	34.0770	34.0770	34.0770	34.0770	34.0770	34.0770	34.0770	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-88.6160	-88.6160	-88.6160	-88.6160	-88.6160	-88.6160	-88.6160	-88.6160	-88.6160	-88.6160	-88.6160	-88.6160	(71)
Water heating gains (Table 5)													
	79.6434	77.0433	72.2842	66.0280	61.7577	55.9875	51.5884	57.8195	60.4167	66.8712	74.0826	77.6463	(72)
Total internal gains													
	354.6956	351.7131	338.3122	317.4705	296.5790	276.6057	264.2273	270.8408	282.0798	303.1198	326.9524	344.7191	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.7600	10.6334	0.7600	0.7000	0.7700	18.6605	(74)
Solar gains	18.6605	35.6612	60.5971	97.3345	131.1184	140.3662	131.0498	103.9713	72.8573	42.4500	23.0201	15.5563	(83)
Total gains	373.3561	387.3743	398.9093	414.8050	427.6975	416.9719	395.2771	374.8120	354.9371	345.5698	349.9725	360.2755	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	39.8583	39.9537	40.0476	40.4946	40.5794	40.9786	40.9786	41.0534	40.8239	40.5794	40.4083	40.2310	
alpha	3.6572	3.6636	3.6698	3.6996	3.7053	3.7319	3.7319	3.7369	3.7216	3.7053	3.6939	3.6821	
util living area													
	0.9902	0.9875	0.9810	0.9629	0.9167	0.8135	0.6783	0.7216	0.8893	0.9661	0.9856	0.9914	(86)
MIT	19.6491	19.7391	19.9328	20.2234	20.5207	20.7624	20.8685	20.8514	20.6685	20.3097	19.9387	19.6329	(87)
Th 2	20.0503	20.0523	20.0543	20.0638	20.0656	20.0739	20.0739	20.0754	20.0707	20.0656	20.0620	20.0583	(88)
util rest of house													
	0.9881	0.9849	0.9766	0.9532	0.8918	0.7513	0.5692	0.6190	0.8464	0.9554	0.9820	0.9896	(89)
MIT 2	18.2241	18.3567	18.6403	19.0675	19.4889	19.8138	19.9299	19.9167	19.6986	19.1958	18.6555	18.2063	(90)
Living area fraction										fLA = Living area / (4) =		0.3936	(91)
MIT	18.7850	18.9008	19.1490	19.5225	19.8950	20.1871	20.2994	20.2846	20.0804	19.6342	19.1605	18.7678	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.6350	18.7508	18.9990	19.3725	19.7450	20.0371	20.1494	20.1346	19.9304	19.4842	19.0105	18.6178	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9840	0.9800	0.9702	0.9441	0.8813	0.7484	0.5790	0.6265	0.8385	0.9467	0.9766	0.9859	(94)
Useful gains	367.3911	379.6458	387.0237	391.6131	376.9394	312.0788	228.8851	234.8016	297.6055	327.1519	341.7919	355.2054	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1024.7712	987.7970	889.3034	736.8864	564.8988	378.0623	246.7984	259.2052	406.9395	623.8266	839.8673	1021.1493	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	489.0908	408.6776	373.6961	248.5968	139.8418	0.0000	0.0000	0.0000	0.0000	220.7260	358.6144	495.4623	(98)
Space heating												2734.7057	(98)
Space heating per m2											(98) / (4) =	39.7775	(99)

8c. Space cooling requirement

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	89.9000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	3041.9418	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	489.0908	408.6776	373.6961	248.5968	139.8418	0.0000	0.0000	0.0000	0.0000	220.7260	358.6144	495.4623	(98)
Space heating efficiency (main heating system 1)													
	89.9000	89.9000	89.9000	89.9000	89.9000	0.0000	0.0000	0.0000	0.0000	89.9000	89.9000	89.9000	(210)
Space heating fuel (main heating system)													
	544.0387	454.5913	415.6797	276.5259	155.5526	0.0000	0.0000	0.0000	0.0000	245.5239	398.9036	551.1260	(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													
	160.4730	139.9906	146.1692	131.3464	128.0320	113.8998	111.0019	122.3709	123.4132	138.8044	146.1856	157.0054	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.1742	87.0877	86.8107	86.1314	84.7719	79.8000	79.8000	79.8000	79.8000	85.7118	86.7214	87.2429	(217)
Fuel for water heating, kWh/month													
	184.0831	160.7467	168.3769	152.4953	151.0312	142.7316	139.1001	153.3469	154.6531	161.9431	168.5692	179.9635	(219)
Water heating fuel used												1917.0408	(219)
Annual totals kWh/year													
Space heating fuel - main system												3041.9418	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												378.9727	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.00 * 1080 * 1.00) =										-863.6197		-863.6197	(233)
Total delivered energy for all uses												4549.3356	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3041.9418	0.2160	657.0594	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1917.0408	0.2160	414.0808	(264)
Space and water heating			1071.1402	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	378.9727	0.5190	196.6868	(268)
Energy saving/generation technologies				
PV Unit	-863.6197	0.5190	-448.2186	(269)
Total CO2, kg/year			858.5334	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			12.4900	(273)

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

DER		12.4900	ZC1
Total Floor Area	TFA	68.7500	
Assumed number of occupants	N	2.2154	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.7527	ZC2
CO2 emissions from cooking, equation (L16)		2.5043	ZC3
Total CO2 emissions		31.7470	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		31.7470	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	68.7500 (1b)	x	2.3800 (2b)	=	163.6250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.7500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	163.6250	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1222	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3722	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3164	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4034	0.3955	0.3876	0.3480	0.3401	0.3006	0.3006	0.2927	0.3164	0.3401	0.3559	0.3718	(22b)
Effective ac	0.5814	0.5782	0.5751	0.5606	0.5578	0.5452	0.5452	0.5428	0.5501	0.5578	0.5633	0.5691	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.3100	1.0000	2.3100			(26)
TER Semi-glazed door			9.1200	1.2000	10.9440			(26a)
TER Opening Type (Uw = 1.40)			4.7600	1.3258	6.3106			(27)
Exposed Floor			8.5000	0.1300	1.1050			(28b)
External Wall 1	29.7200	16.1900	13.5300	0.1800	2.4354			(29a)
Wall to Corridor	7.7500		7.7500	0.1800	1.3950			(29a)
Flat Roof - To Terrace	68.7500		68.7500	0.1300	8.9375			(30)
Total net area of external elements Aum(A, m2)			114.7200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.4375			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	7.5891	(36)
Total fabric heat loss (33) + (36) =	41.0266	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.3917	31.2211	31.0538	30.2684	30.1214	29.4373	29.4373	29.3106	29.7008	30.1214	30.4187	30.7295	(38)
Heat transfer coeff	72.4183	72.2477	72.0805	71.2950	71.1480	70.4639	70.4639	70.3372	70.7274	71.1480	71.4453	71.7561	(39)
Average = Sum(39)m / 12 =												71.2943	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0534	1.0509	1.0484	1.0370	1.0349	1.0249	1.0249	1.0231	1.0288	1.0349	1.0392	1.0437	(40)
HLP (average)												1.0370	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2154 (42)
Average daily hot water use (litres/day)	86.8157 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.4973	92.0247	88.5520	85.0794	81.6068	78.1341	78.1341	81.6068	85.0794	88.5520	92.0247	95.4973	(44)
Energy conte	141.6197	123.8615	127.8140	111.4313	106.9210	92.2647	85.4968	98.1088	99.2806	115.7019	126.2977	137.1511	(45)
Energy content (annual)										Total = Sum(45)m =		1365.9493	(45)
Distribution loss (46)m = 0.15 x (45)m	21.2430	18.5792	19.1721	16.7147	16.0382	13.8397	12.8245	14.7163	14.8921	17.3553	18.9447	20.5727	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	48.6644	42.3566	45.1251	41.9570	41.5859	38.5319	39.8163	41.5859	41.9570	45.1251	45.3820	48.6644 (61)
Total heat required for water heating calculated for each month												
	190.2841	166.2181	172.9391	153.3883	148.5069	130.7966	125.3131	139.6948	141.2375	160.8271	171.6797	185.8155 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
	190.2841	166.2181	172.9391	153.3883	148.5069	130.7966	125.3131	139.6948	141.2375	160.8271	171.6797	185.8155 (64)
Total per year (kWh/year) = Sum(64)m =												1886.7009 (64)
Heat gains from water heating, kWh/month												
	59.2547	51.7731	53.7794	47.5402	45.9477	40.3110	38.3818	43.0177	43.5000	49.7522	53.3395	57.7688 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	110.7699	110.7699	110.7699	110.7699	110.7699	110.7699	110.7699	110.7699	110.7699	110.7699	110.7699	110.7699	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	21.4590	19.0597	15.5004	11.7348	8.7719	7.4056	8.0020	10.4013	13.9606	17.7262	20.6891	22.0554	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	194.3622	196.3791	191.2966	180.4767	166.8185	153.9817	145.4059	143.3890	148.4715	159.2914	172.9496	185.7864	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.0770	34.0770	34.0770	34.0770	34.0770	34.0770	34.0770	34.0770	34.0770	34.0770	34.0770	34.0770	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-88.6160	-88.6160	-88.6160	-88.6160	-88.6160	-88.6160	-88.6160	-88.6160	-88.6160	-88.6160	-88.6160	-88.6160	(71)
Water heating gains (Table 5)													
	79.6434	77.0433	72.2842	66.0280	61.7577	55.9875	51.5884	57.8195	60.4167	66.8712	74.0826	77.6463	(72)
Total internal gains													
	354.6956	351.7131	338.3122	317.4705	296.5790	276.6057	264.2273	270.8408	282.0798	303.1198	326.9524	344.7191	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.7600	10.6334	0.6300	0.7000	0.7700	15.4686	(74)

Solar gains	15.4686	29.5613	50.2318	80.6852	108.6903	116.3562	108.6334	86.1867	60.3949	35.1888	19.0825	12.8954	(83)
Total gains	370.1641	381.2743	388.5440	398.1556	405.2693	392.9619	372.8606	357.0275	342.4747	338.3086	346.0349	357.6145	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.9268	66.0825	66.2358	66.9655	67.1038	67.7553	67.7553	67.8774	67.5029	67.1038	66.8246	66.5352	
alpha	5.3951	5.4055	5.4157	5.4644	5.4736	5.5170	5.5170	5.5252	5.5002	5.4736	5.4550	5.4357	
util living area													
	0.9988	0.9984	0.9970	0.9921	0.9724	0.8984	0.7592	0.8022	0.9528	0.9925	0.9979	0.9990	(86)
MIT	19.8324	19.9114	20.0845	20.3477	20.6266	20.8631	20.9623	20.9481	20.7741	20.4360	20.0969	19.8184	(87)
Th 2	20.0391	20.0412	20.0432	20.0526	20.0544	20.0626	20.0626	20.0641	20.0594	20.0544	20.0508	20.0471	(88)
util rest of house													
	0.9984	0.9978	0.9959	0.9885	0.9573	0.8377	0.6311	0.6842	0.9192	0.9883	0.9971	0.9987	(89)
MIT 2	18.4705	18.5874	18.8420	19.2323	19.6325	19.9485	20.0449	20.0366	19.8411	19.3630	18.8659	18.4557	(90)
Living area fraction									fLA = Living area / (4) =			0.3936	(91)
MIT	19.0065	19.1085	19.3310	19.6713	20.0238	20.3085	20.4060	20.3954	20.2083	19.7853	19.3504	18.9921	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0065	19.1085	19.3310	19.6713	20.0238	20.3085	20.4060	20.3954	20.2083	19.7853	19.3504	18.9921	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9978	0.9970	0.9947	0.9865	0.9567	0.8563	0.6821	0.7306	0.9259	0.9867	0.9962	0.9982	(94)
Useful gains	369.3564	380.1386	386.4801	392.7842	387.7211	336.4771	254.3439	260.8522	317.0802	333.8039	344.7065	356.9731	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1065.0222	1026.5323	924.8672	767.9409	592.2209	402.2413	268.1823	281.0218	432.0278	653.5194	875.2357	1061.4215	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	517.5753	434.3765	400.5600	270.1128	152.1479	0.0000	0.0000	0.0000	0.0000	237.8683	381.9810	524.1097	(98)
Space heating												2918.7316	(98)
Space heating per m2											(98) / (4) =	42.4543	(99)

8c. Space cooling requirement

Not applicable

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

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	93.4000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	3124.9803	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	517.5753	434.3765	400.5600	270.1128	152.1479	0.0000	0.0000	0.0000	0.0000	237.8683	381.9810	524.1097	(98)
Space heating efficiency (main heating system 1)													
	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)													
	554.1492	465.0712	428.8651	289.2000	162.8992	0.0000	0.0000	0.0000	0.0000	254.6770	408.9733	561.1452	(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													
	190.2841	166.2181	172.9391	153.3883	148.5069	130.7966	125.3131	139.6948	141.2375	160.8271	171.6797	185.8155	(64)
Efficiency of water heater												80.3000	(216)
(217)m	87.4434	87.3590	87.0966	86.4612	85.1122	80.3000	80.3000	80.3000	80.3000	86.0349	87.0066	87.5188	(217)
Fuel for water heating, kWh/month													
	217.6082	190.2700	198.5603	177.4071	174.4838	162.8850	156.0562	173.9661	175.8874	186.9325	197.3180	212.3150	(219)
Water heating fuel used												2223.6895	(219)
Annual totals kWh/year													
Space heating fuel - main system												3124.9803	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												378.9727	(232)
Total delivered energy for all uses												5802.6424	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3124.9803	0.2160	674.9957	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2223.6895	0.2160	480.3169	(264)
Space and water heating			1155.3127	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	378.9727	0.5190	196.6868	(268)
Total CO2, kg/m2/year			1390.9245	(272)
Emissions per m2 for space and water heating			16.8045	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.8609	(272b)
Emissions per m2 for pumps and fans			0.5662	(272c)
Target Carbon Dioxide Emission Rate (TER) = (16.8045 * 1.00) + 2.8609 + 0.5662, rounded to 2 d.p.			20.2300	(273)

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

Property Reference	Flat 15 - 1 Hampshire St.	**Issued on Date**	11/05/2020
Assessment Reference	AD - Gas Combi + PV	**Prop Type Ref**	
Property	Flat 15, 1 Hampshire Street, London, NW5 2TE		

SAP Rating	88 B	**DER**	14.04	**TER**	19.73
Environmental	90 B	**% DER<TER**	28.83		
CO_2 Emissions (t/year)	0.85	**DFEE**	48.99	**TFEE**	56.05
General Requirements Compliance	Pass	**% DFEE<TFEE**	12.59		

Assessor Details	Mr. Andrew Gwynne, Andrew Gwynne, Tel: 01636 653055, andrew.gwynne@mesenergyservices.co.uk	**Assessor ID**	P741-0001
Client			

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

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

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

DWELLING AS DESIGNED

Top-floor flat, total floor area 84 m²

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

1a TER and DER
Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 19.73 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.04 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)56.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)49.0 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.13 (max. 0.25)	0.13 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.35 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated using user-specified y-value of 0.080

3 Air permeability
Air permeability at 50 pascals: 5.00 (design value)
Maximum 10.0 OK

4 Heating efficiency
Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
tbc tbc
Combi boiler
Efficiency: 89.0% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

5 Cylinder insulation
Hot water storage No cylinder

6 Controls
Space heating controls: Time and temperature zone control OK

Hot water controls: No cylinder

Boiler interlock Yes OK

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

8 Mechanical ventilation
Not applicable

9 Summertime temperature
Overheating risk (Thames Valley): Not significant OK
Based on:
Overshading: Average
Windows facing North: 4.93 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

10 Key features
Party wall U-value 0.00 W/m²K
Roof U-value 0.11 W/m²K
Door U-value 1.00 W/m²K
Photovoltaic array 1.00 kW

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	84.0900 (1b)	x	2.3800 (2b)	=	200.1342	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.0900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	200.1342	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1499	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3999	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3399	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4334	0.4249	0.4164	0.3739	0.3654	0.3229	0.3229	0.3144	0.3399	0.3654	0.3824	0.3994	(22b)
Effective ac	0.5939	0.5903	0.5867	0.5699	0.5668	0.5521	0.5521	0.5494	0.5578	0.5668	0.5731	0.5798	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 1.40)			4.9300	1.3258	6.5360			(27)
Ext Door			2.3100	1.0000	2.3100			(26)
Glazed Door			13.0700	1.4000	18.2980			(26a)
Exposed Floor			8.5000	0.1300	1.1050			(28b)
External Wall 1	33.3900	20.3100	13.0800	0.1800	2.3544	0.0000	0.0000	(29a)
Wall to Corridor	13.7000		13.7000	0.1671	2.2888	0.0000	0.0000	(29a)
Flat Roof - To Terrace	84.0900		84.0900	0.1100	9.2499	9.0000	756.8100	(30)
Total net area of external elements Aum(A, m2)			139.6800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.1421			(33)
Party Wall 1			52.0100	0.0000	0.0000	0.0000	0.0000	(32)
Party Floor			75.5900			0.0000	0.0000	(32d)
Stud Wall			180.4500			75.0000	13533.7500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		14290.5600	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							169.9436	(35)
Thermal bridges (User defined value 0.080 * total exposed area)							11.1744	(36)
Total fabric heat loss					(33) + (36) =		53.3165	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.2246	38.9838	38.7477	37.6388	37.4314	36.4656	36.4656	36.2867	36.8376	37.4314	37.8511	38.2898	(38)
Heat transfer coeff	92.5411	92.3003	92.0642	90.9554	90.7479	89.7821	89.7821	89.6033	90.1541	90.7479	91.1676	91.6064	(39)
Average = Sum(39)m / 12 =												90.9544	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1005	1.0976	1.0948	1.0816	1.0792	1.0677	1.0677	1.0656	1.0721	1.0792	1.0842	1.0894	(40)
HLP (average)												1.0816	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5359 (42)
Average daily hot water use (litres/day)		94.4276 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.8704	100.0933	96.3162	92.5391	88.7620	84.9849	84.9849	88.7620	92.5391	96.3162	100.0933	103.8704	(44)
Energy conte	154.0368	134.7216	139.0206	121.2015	116.2957	100.3544	92.9931	106.7109	107.9854	125.8466	137.3714	149.1764	(45)
Energy content (annual)										Total = Sum(45)m =		1485.7143	(45)

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

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	23.1055	20.2082	20.8531	18.1802	17.4444	15.0532	13.9490	16.0066	16.1978	18.8770	20.6057	22.3765	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	50.9589	46.0274	49.0817	45.6357	45.2321	41.9103	43.3074	45.2321	45.6357	49.0817	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	204.9957	180.7490	188.1023	166.8372	161.5279	142.2647	136.3004	151.9431	153.6211	174.9282	186.6864	200.1353	(62)
WWHRS	-33.4218	-29.4062	-30.0132	-24.6990	-22.9361	-18.9229	-16.0184	-19.3934	-19.9577	-24.6681	-28.5698	-32.3026	eq.(G10)
Total of WWHRS savings												-300.3092	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h													
	171.5739	151.3428	158.0890	142.1383	138.5918	123.3418	120.2821	132.5496	133.6634	150.2601	158.1166	167.8327	(64)
								Total per year (kWh/year) = Sum(64)m =				1747.7820	(64)
Heat gains from water heating, kWh/month													
	63.9570	56.3018	58.4948	51.7084	49.9764	43.8454	41.7470	46.7894	47.3141	54.1144	58.0047	62.3409	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	126.7950	126.7950	126.7950	126.7950	126.7950	126.7950	126.7950	126.7950	126.7950	126.7950	126.7950	126.7950	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	25.8191	22.9323	18.6498	14.1191	10.5542	8.9103	9.6279	12.5147	16.7972	21.3279	24.8928	26.5367	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	227.7759	230.1395	224.1833	211.5033	195.4970	180.4534	170.4033	168.0397	173.9959	186.6759	202.6822	217.7259	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.6795	35.6795	35.6795	35.6795	35.6795	35.6795	35.6795	35.6795	35.6795	35.6795	35.6795	35.6795	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-101.4360	-101.4360	-101.4360	-101.4360	-101.4360	-101.4360	-101.4360	-101.4360	-101.4360	-101.4360	-101.4360	-101.4360	(71)
Water heating gains (Table 5)													
	85.9637	83.7824	78.6220	71.8173	67.1725	60.8964	56.1116	62.8890	65.7140	72.7344	80.5621	83.7915	(72)
Total internal gains													
	403.5972	400.8927	385.4936	361.4782	337.2623	314.2986	300.1813	307.4819	320.5456	344.7767	372.1757	392.0926	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.9300	10.6334	0.7600	0.7000	0.7700	19.3270	(74)

Solar gains	19.3270	36.9348	62.7613	100.8107	135.8013	145.3793	135.7301	107.6845	75.4594	43.9661	23.8423	16.1119	(83)
Total gains	422.9242	437.8276	448.2549	462.2889	473.0635	459.6779	435.9114	415.1664	396.0050	388.7428	396.0180	408.2045	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	42.8955	43.0074	43.1177	43.6434	43.7432	44.2137	44.2137	44.3020	44.0313	43.7432	43.5418	43.3332	
alpha	3.8597	3.8672	3.8745	3.9096	3.9162	3.9476	3.9476	3.9535	3.9354	3.9162	3.9028	3.8889	
util living area													
	0.9951	0.9937	0.9903	0.9802	0.9517	0.8760	0.7568	0.7952	0.9311	0.9815	0.9926	0.9958	(86)
MIT	19.6533	19.7361	19.9172	20.1924	20.4816	20.7347	20.8570	20.8377	20.6417	20.2893	19.9343	19.6412	(87)
Th 2	20.0004	20.0028	20.0051	20.0159	20.0179	20.0273	20.0273	20.0291	20.0237	20.0179	20.0138	20.0095	(88)
util rest of house													
	0.9939	0.9922	0.9876	0.9740	0.9334	0.8204	0.6420	0.6912	0.8967	0.9745	0.9905	0.9948	(89)
MIT 2	18.1809	18.3037	18.5698	18.9777	19.3931	19.7423	19.8803	19.8648	19.6234	19.1214	18.6017	18.1700	(90)
Living area fraction										fLA = Living area / (4) =		0.3169	(91)
MIT	18.6475	18.7577	18.9968	19.3627	19.7381	20.0569	20.1898	20.1731	19.9461	19.4915	19.0240	18.6363	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.4975	18.6077	18.8468	19.2127	19.5881	19.9069	20.0398	20.0231	19.7961	19.3415	18.8740	18.4863	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9914	0.9891	0.9834	0.9671	0.9230	0.8119	0.6437	0.6904	0.8861	0.9678	0.9870	0.9926	(94)
Useful gains	419.2997	433.0731	440.7963	447.0704	436.6260	373.2257	280.6063	286.6305	350.9082	376.2308	390.8779	405.1682	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1313.8556	1265.2213	1136.6985	937.9945	715.8252	476.4606	308.8329	324.6406	513.5277	793.2766	1073.4085	1308.7141	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	665.5496	559.2036	517.7512	353.4653	207.7242	0.0000	0.0000	0.0000	0.0000	310.2821	491.4221	672.2381	(98)
Space heating												3777.6363	(98)
Space heating per m2											(98) / (4) =	44.9237	(99)

8c. Space cooling requirement

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	89.9000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	4202.0425	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	665.5496	559.2036	517.7512	353.4653	207.7242	0.0000	0.0000	0.0000	0.0000	310.2821	491.4221	672.2381	(98)
Space heating efficiency (main heating system 1)													
	89.9000	89.9000	89.9000	89.9000	89.9000	0.0000	0.0000	0.0000	0.0000	89.9000	89.9000	89.9000	(210)
Space heating fuel (main heating system)													
	740.3222	622.0285	575.9190	393.1761	231.0614	0.0000	0.0000	0.0000	0.0000	345.1413	546.6319	747.7621	(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													
	171.5739	151.3428	158.0890	142.1383	138.5918	123.3418	120.2821	132.5496	133.6634	150.2601	158.1166	167.8327	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.6269	87.5401	87.3150	86.7510	85.5660	79.8000	79.8000	79.8000	79.8000	86.3348	87.2130	87.6829	(217)
Fuel for water heating, kWh/month													
	195.8004	172.8839	181.0560	163.8462	161.9706	154.5637	150.7294	166.1023	167.4980	174.0434	181.2994	191.4088	(219)
Water heating fuel used												2061.2022	(219)
Annual totals kWh/year													
Space heating fuel - main system												4202.0425	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												455.9734	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.00 * 1080 * 1.00) =										-863.6197		-863.6197	(233)
Total delivered energy for all uses												5930.5985	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4202.0425	0.2160	907.6412	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2061.2022	0.2160	445.2197	(264)
Space and water heating			1352.8609	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	455.9734	0.5190	236.6502	(268)
Energy saving/generation technologies				
PV Unit	-863.6197	0.5190	-448.2186	(269)
Total CO2, kg/year			1180.2174	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.0400	(273)

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

DER		14.0400	ZC1
Total Floor Area	TFA	84.0900	
Assumed number of occupants	N	2.5359	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.0513	ZC2
CO2 emissions from cooking, equation (L16)		2.1389	ZC3
Total CO2 emissions		32.2302	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		32.2302	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	84.0900 (1b)	x	2.3800 (2b)	=	200.1342	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.0900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	200.1342	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1499	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3999	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3399	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4334	0.4249	0.4164	0.3739	0.3654	0.3229	0.3229	0.3144	0.3399	0.3654	0.3824	0.3994	(22b)
Effective ac	0.5939	0.5903	0.5867	0.5699	0.5668	0.5521	0.5521	0.5494	0.5578	0.5668	0.5731	0.5798	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.3100	1.0000	2.3100			(26)
TER Semi-glazed door			13.0700	1.2000	15.6840			(26a)
TER Opening Type (Uw = 1.40)			4.9300	1.3258	6.5360			(27)
Exposed Floor			8.5000	0.1300	1.1050			(28b)
External Wall 1	33.3900	20.3100	13.0800	0.1800	2.3544			(29a)
Wall to Corridor	13.7000		13.7000	0.1800	2.4660			(29a)
Flat Roof - To Terrace	84.0900		84.0900	0.1300	10.9317			(30)
Total net area of external elements Aum(A, m2)			139.6800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.3871			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.7341	(36)
Total fabric heat loss (33) + (36) =	50.1212	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.2246	38.9838	38.7477	37.6388	37.4314	36.4656	36.4656	36.2867	36.8376	37.4314	37.8511	38.2898	(38)
Heat transfer coeff	89.3458	89.1050	88.8689	87.7600	87.5525	86.5868	86.5868	86.4079	86.9588	87.5525	87.9722	88.4110	(39)
Average = Sum(39)m / 12 =												87.7590	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0625	1.0596	1.0568	1.0436	1.0412	1.0297	1.0297	1.0276	1.0341	1.0412	1.0462	1.0514	(40)
HLP (average)												1.0436	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5359 (42)
Average daily hot water use (litres/day)	94.4276 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.8704	100.0933	96.3162	92.5391	88.7620	84.9849	84.9849	88.7620	92.5391	96.3162	100.0933	103.8704	(44)
Energy conte	154.0368	134.7216	139.0206	121.2015	116.2957	100.3544	92.9931	106.7109	107.9854	125.8466	137.3714	149.1764	(45)
Energy content (annual)										Total = Sum(45)m =		1485.7143	(45)
Distribution loss (46)m = 0.15 x (45)m	23.1055	20.2082	20.8531	18.1802	17.4444	15.0532	13.9490	16.0066	16.1978	18.8770	20.6057	22.3765	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	50.9589	46.0274	49.0817	45.6357	45.2321	41.9103	43.3074	45.2321	45.6357	49.0817	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
	204.9957	180.7490	188.1023	166.8372	161.5279	142.2647	136.3004	151.9431	153.6211	174.9282	186.6864	200.1353 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
								Solar input (sum of months) = Sum(63)m =				0.0000 (63)
Output from w/h												
	204.9957	180.7490	188.1023	166.8372	161.5279	142.2647	136.3004	151.9431	153.6211	174.9282	186.6864	200.1353 (64)
								Total per year (kWh/year) = Sum(64)m =				2048.0913 (64)
Heat gains from water heating, kWh/month												
	63.9570	56.3018	58.4948	51.7084	49.9764	43.8454	41.7470	46.7894	47.3141	54.1144	58.0047	62.3409 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	126.7950	126.7950	126.7950	126.7950	126.7950	126.7950	126.7950	126.7950	126.7950	126.7950	126.7950	126.7950	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	25.8191	22.9323	18.6498	14.1191	10.5542	8.9103	9.6279	12.5147	16.7972	21.3279	24.8928	26.5367	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	227.7759	230.1395	224.1833	211.5033	195.4970	180.4534	170.4033	168.0397	173.9959	186.6759	202.6822	217.7259	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.6795	35.6795	35.6795	35.6795	35.6795	35.6795	35.6795	35.6795	35.6795	35.6795	35.6795	35.6795	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-101.4360	-101.4360	-101.4360	-101.4360	-101.4360	-101.4360	-101.4360	-101.4360	-101.4360	-101.4360	-101.4360	-101.4360	(71)
Water heating gains (Table 5)													
	85.9637	83.7824	78.6220	71.8173	67.1725	60.8964	56.1116	62.8890	65.7140	72.7344	80.5621	83.7915	(72)
Total internal gains													
	403.5972	400.8927	385.4936	361.4782	337.2623	314.2986	300.1813	307.4819	320.5456	344.7767	372.1757	392.0926	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.9300	10.6334	0.6300	0.7000	0.7700	16.0210	(74)

Solar gains	16.0210	30.6170	52.0258	83.5668	112.5721	120.5118	112.5131	89.2648	62.5519	36.4456	19.7640	13.3559	(83)
Total gains	419.6182	431.5098	437.5194	445.0449	449.8343	434.8103	412.6944	396.7467	383.0974	381.2223	391.9397	405.4485	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.3593	65.5360	65.7101	66.5404	66.6980	67.4420	67.4420	67.5816	67.1535	66.6980	66.3798	66.0504	
alpha	5.3573	5.3691	5.3807	5.4360	5.4465	5.4961	5.4961	5.5054	5.4769	5.4465	5.4253	5.4034	
util living area													
	0.9992	0.9989	0.9980	0.9948	0.9819	0.9284	0.8103	0.8471	0.9672	0.9949	0.9986	0.9993	(86)
MIT	19.7824	19.8604	20.0321	20.2948	20.5755	20.8282	20.9468	20.9299	20.7382	20.3947	20.0535	19.7716	(87)
Th 2	20.0316	20.0339	20.0362	20.0471	20.0492	20.0587	20.0587	20.0604	20.0550	20.0492	20.0450	20.0407	(88)
util rest of house													
	0.9989	0.9985	0.9972	0.9924	0.9714	0.8791	0.6866	0.7370	0.9418	0.9920	0.9980	0.9991	(89)
MIT 2	18.3919	18.5077	18.7605	19.1520	19.5585	19.9074	20.0317	20.0205	19.7926	19.2996	18.7985	18.3827	(90)
Living area fraction									fLA = Living area / (4) =			0.3169	(91)
MIT	18.8326	18.9364	19.1635	19.5142	19.8808	20.1992	20.3217	20.3087	20.0923	19.6467	19.1962	18.8229	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8326	18.9364	19.1635	19.5142	19.8808	20.1992	20.3217	20.3087	20.0923	19.6467	19.1962	18.8229	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9984	0.9978	0.9962	0.9905	0.9689	0.8882	0.7259	0.7709	0.9431	0.9902	0.9972	0.9987	(94)
Useful gains	418.9490	430.5758	435.8578	440.8158	435.8549	386.1790	299.5727	305.8541	361.3096	377.5044	390.8405	404.9193	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1298.4277	1250.7156	1125.3923	931.5026	716.2512	484.8197	322.2537	337.7398	521.0798	792.0595	1064.1310	1292.8220	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	654.3321	551.1339	513.0136	353.2945	208.6148	0.0000	0.0000	0.0000	0.0000	308.4290	484.7691	660.5996	(98)
Space heating												3734.1867	(98)
Space heating per m2											(98) / (4) =	44.4070	(99)

8c. Space cooling requirement

Not applicable

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

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.4000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												3998.0585	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	654.3321	551.1339	513.0136	353.2945	208.6148	0.0000	0.0000	0.0000	0.0000	308.4290	484.7691	660.5996	(98)
Space heating efficiency (main heating system 1)													
	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)													
	700.5697	590.0791	549.2651	378.2596	223.3563	0.0000	0.0000	0.0000	0.0000	330.2238	519.0248	707.2801	(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													
	204.9957	180.7490	188.1023	166.8372	161.5279	142.2647	136.3004	151.9431	153.6211	174.9282	186.6864	200.1353	(64)
Efficiency of water heater												80.3000	(216)
(217)m	87.7666	87.6765	87.4490	86.8943	85.6962	80.3000	80.3000	80.3000	80.3000	86.4642	87.3455	87.8313	(217)
Fuel for water heating, kWh/month													
	233.5692	206.1543	215.0993	192.0002	188.4889	177.1665	169.7390	189.2192	191.3090	202.3129	213.7333	227.8633	(219)
Water heating fuel used												2406.6552	(219)
Annual totals kWh/year													
Space heating fuel - main system												3998.0585	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												455.9734	(232)
Total delivered energy for all uses												6935.6872	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3998.0585	0.2160	863.5806	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2406.6552	0.2160	519.8375	(264)
Space and water heating			1383.4182	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	455.9734	0.5190	236.6502	(268)
Total CO2, kg/m2/year			1658.9934	(272)
Emissions per m2 for space and water heating			16.4516	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.8142	(272b)
Emissions per m2 for pumps and fans			0.4629	(272c)
Target Carbon Dioxide Emission Rate (TER) = (16.4516 * 1.00) + 2.8142 + 0.4629, rounded to 2 d.p.			19.7300	(273)

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

Property Reference	Flat 16 - 1 Hampshire St.	**Issued on Date**	11/05/2020
Assessment Reference	AD - Gas Combi + PV	**Prop Type Ref**	
Property	Flat 16, 1 Hampshire Street, London, NW5 2TE		

SAP Rating	88 B	**DER**	13.23	**TER**	19.31
Environmental	90 B	**% DER<TER**	31.50		
CO_2 Emissions (t/year)	0.85	**DFEE**	45.43	**TFEE**	54.97
General Requirements Compliance	Pass	**% DFEE<TFEE**	17.34		

Assessor Details	Mr. Andrew Gwynne, Andrew Gwynne, Tel: 01636 653055, andrew.gwynne@mesenergyservices.co.uk	**Assessor ID**	P741-0001
Client			

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

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

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

Top-floor flat, total floor area 88 m²

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

1a TER and DER
Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 19.31 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.23 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)55.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)45.4 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	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.34 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated using user-specified y-value of 0.058

---
3 Air permeability
Air permeability at 50 pascals: 5.00 (design value)
Maximum 10.0 OK

---
4 Heating efficiency
Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
tbc tbc
Combi boiler
Efficiency: 89.0% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage No cylinder

---
6 Controls
Space heating controls: Time and temperature zone control OK

Hot water controls: No cylinder

Boiler interlock Yes OK

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

---
8 Mechanical ventilation
Not applicable

---
9 Summertime temperature
Overheating risk (Thames Valley): Not significant OK
Based on:
Overshading: Average
Windows facing North: 2.55 m², No overhang
Windows facing West: 2.38 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

---
10 Key features
Party wall U-value 0.00 W/m²K
Roof U-value 0.11 W/m²K
Door U-value 1.00 W/m²K
Photovoltaic array 1.00 kW

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	87.8600 (1b)	x	2.3800 (2b)	=	209.1068	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.8600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	209.1068	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1435	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3935	(18)
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3640	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4640	0.4549	0.4458	0.4004	0.3913	0.3458	0.3458	0.3367	0.3640	0.3913	0.4095	0.4276	(22b)
Effective ac	0.6077	0.6035	0.5994	0.5801	0.5765	0.5598	0.5598	0.5567	0.5662	0.5765	0.5838	0.5914	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 1.40)			4.9300	1.3258	6.5360			(27)
Ext Door			2.3100	1.0000	2.3100			(26)
Glazed Door			8.6200	1.4000	12.0680			(26a)
External Wall 1	78.2200	15.8600	62.3600	0.1800	11.2248	0.0000	0.0000	(29a)
Flat Roof - To Terrace	87.8600		87.8600	0.1100	9.6646	9.0000	790.7400	(30)
Total net area of external elements Aum(A, m2)			166.0800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.8034			(33)
Party Wall 1			31.8700	0.0000	0.0000	0.0000	0.0000	(32)
Party Floor 1			87.8600			0.0000	0.0000	(32d)
Stud Wall			144.8500			75.0000	10863.7500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		11654.4900	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							132.6484	(35)
Thermal bridges (User defined value 0.058 * total exposed area)							9.6326	(36)
Total fabric heat loss					(33) + (36) =		51.4360	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	41.9324	41.6439	41.3611	40.0328	39.7843	38.6274	38.6274	38.4132	39.0730	39.7843	40.2870	40.8126	(38)
Heat transfer coeff	93.3684	93.0799	92.7971	91.4688	91.2203	90.0634	90.0634	89.8492	90.5090	91.2203	91.7230	92.2486	(39)
Average = Sum(39)m / 12 =												91.4676	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0627	1.0594	1.0562	1.0411	1.0382	1.0251	1.0251	1.0226	1.0302	1.0382	1.0440	1.0500	(40)
HLP (average)												1.0411	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5953 (42)
Average daily hot water use (litres/day)		95.8379 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	105.4217	101.5882	97.7547	93.9212	90.0876	86.2541	86.2541	90.0876	93.9212	97.7547	101.5882	105.4217	(44)
Energy conte	156.3374	136.7337	141.0969	123.0117	118.0326	101.8532	94.3820	108.3047	109.5982	127.7261	139.4230	151.4044	(45)
Energy content (annual)										Total = Sum(45)m =		1507.9037	(45)
Distribution loss (46)m = 0.15 x (45)m	23.4506	20.5100	21.1645	18.4518	17.7049	15.2780	14.1573	16.2457	16.4397	19.1589	20.9135	22.7107	(46)
Water storage loss:													

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	50.9589	46.0274	49.8147	46.3173	45.9077	42.5363	43.9542	45.9077	46.3173	49.8147	49.3151	50.9589	(61)

Total heat required for water heating calculated for each month

	207.2963	182.7611	190.9116	169.3290	163.9403	144.3895	138.3361	154.2124	155.9155	177.5408	188.7381	202.3633	(62)
WWHRS	-34.0908	-29.9951	-30.6141	-25.1912	-23.3920	-19.2983	-16.3347	-19.7769	-20.3530	-25.1583	-29.1397	-32.9497	eq.(G10)

Total of WWHRS savings -306.2937

Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)

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

Output from w/h

	173.2055	152.7659	160.2975	144.1377	140.5483	125.0912	122.0015	134.4355	135.5625	152.3826	159.5984	169.4136	(64)

Total per year (kWh/year) = Sum(64)m = 1769.4401 (64)

Heat gains from water heating, kWh/month

	64.7219	56.9708	59.3684	52.4807	50.7228	44.5003	42.3705	47.4882	48.0207	54.9226	58.6869	63.0817	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	129.7641	129.7641	129.7641	129.7641	129.7641	129.7641	129.7641	129.7641	129.7641	129.7641	129.7641	129.7641	(66)

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

	26.8184	23.8199	19.3716	14.6656	10.9627	9.2552	10.0005	12.9991	17.4473	22.1534	25.8563	27.5638	(67)

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

	235.0851	237.5246	231.3772	218.2903	201.7704	186.2440	175.8714	173.4320	179.5793	192.6663	209.1862	224.7126	(68)

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

	35.9764	35.9764	35.9764	35.9764	35.9764	35.9764	35.9764	35.9764	35.9764	35.9764	35.9764	35.9764	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-103.8112	-103.8112	-103.8112	-103.8112	-103.8112	-103.8112	-103.8112	-103.8112	-103.8112	-103.8112	-103.8112	-103.8112	(71)

Water heating gains (Table 5)

	86.9918	84.7780	79.7962	72.8899	68.1758	61.8059	56.9497	63.8283	66.6954	73.8207	81.5096	84.7872	(72)

Total internal gains

	413.8246	411.0516	395.4743	370.7750	345.8381	322.2343	307.7508	315.1885	328.6513	353.5696	381.4813	401.9928	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.5500	10.6334	0.7600	0.7000	0.7700	9.9967	(74)
West	2.3800	19.6403	0.7600	0.7000	0.7700	17.2333	(80)

Solar gains	27.2300	52.8163	87.9817	133.1145	169.4751	176.7789	166.9161	138.7721	103.6015	62.7433	33.8202	22.5056	(83)
Total gains	441.0546	463.8679	483.4560	503.8895	515.3132	499.0132	474.6669	453.9606	432.2528	416.3128	415.3014	424.4984	(84)

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7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	34.6730	34.7804	34.8864	35.3930	35.4895	35.9453	35.9453	36.0310	35.7683	35.4895	35.2949	35.0938	
alpha	3.3115	3.3187	3.3258	3.3595	3.3660	3.3964	3.3964	3.4021	3.3846	3.3660	3.3530	3.3396	
util living area	0.9890	0.9858	0.9785	0.9600	0.9173	0.8247	0.6985	0.7353	0.8893	0.9639	0.9842	0.9904	(86)
MIT	19.4499	19.5556	19.7757	20.0996	20.4250	20.7026	20.8350	20.8155	20.6033	20.1988	19.7804	19.4367	(87)
Th 2	20.0314	20.0341	20.0368	20.0492	20.0516	20.0625	20.0625	20.0645	20.0583	20.0516	20.0469	20.0419	(88)
util rest of house	0.9869	0.9831	0.9739	0.9503	0.8940	0.7670	0.5927	0.6370	0.8488	0.9535	0.9806	0.9885	(89)
MIT 2	17.9325	18.0886	18.4108	18.8888	19.3532	19.7346	19.8871	19.8707	19.6082	19.0366	18.4261	17.9206	(90)

Living area fraction fLA = Living area / (4) = 0.3242 (91)

MIT	18.4244	18.5641	18.8532	19.2813	19.7006	20.0484	20.1944	20.1770	19.9307	19.4133	18.8651	18.4120	(92)

Temperature adjustment -0.1500

adjusted MIT	18.2744	18.4141	18.7032	19.1313	19.5506	19.8984	20.0444	20.0270	19.7807	19.2633	18.7151	18.2620	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9816	0.9767	0.9653	0.9382	0.8785	0.7550	0.5904	0.6324	0.8338	0.9417	0.9736	0.9837	(94)
Useful gains	432.9351	453.0374	466.6962	472.7335	452.6984	376.7385	280.2482	287.0971	360.4066	392.0564	404.3560	417.5957	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1304.7629	1257.8918	1132.4260	935.8469	716.1350	477.1896	310.2121	325.8795	514.1584	790.2693	1065.3740	1297.2048	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	648.6399	540.8621	495.3029	333.4417	195.9968	0.0000	0.0000	0.0000	0.0000	296.2704	475.9330	654.4292	(98)

Space heating 3640.8760 (98)

Space heating per m2 (98) / (4) = 41.4395 (99)

8c. Space cooling requirement

Not applicable

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.9000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												4049.9177	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	648.6399	540.8621	495.3029	333.4417	195.9968	0.0000	0.0000	0.0000	0.0000	296.2704	475.9330	654.4292	(98)
Space heating efficiency (main heating system 1)													
	89.9000	89.9000	89.9000	89.9000	89.9000	0.0000	0.0000	0.0000	0.0000	89.9000	89.9000	89.9000	(210)
Space heating fuel (main heating system)													
	721.5127	601.6264	550.9488	370.9028	218.0165	0.0000	0.0000	0.0000	0.0000	329.5555	529.4027	727.9523	(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													
	173.2055	152.7659	160.2975	144.1377	140.5483	125.0912	122.0015	134.4355	135.5625	152.3826	159.5984	169.4136	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.5643	87.4620	87.2015	86.5923	85.3867	79.8000	79.8000	79.8000	79.8000	86.1947	87.1306	87.6195	(217)
Fuel for water heating, kWh/month													
	197.8037	174.6655	183.8243	166.4557	164.6020	156.7559	152.8840	168.4655	169.8778	176.7888	183.1714	193.3514	(219)
Water heating fuel used												2088.6461	(219)
Annual totals kWh/year													
Space heating fuel - main system												4049.9177	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												473.6217	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.00 * 1080 * 1.00) =										-863.6197		-863.6197	(233)
Total delivered energy for all uses												5823.5659	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4049.9177	0.2160	874.7822	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2088.6461	0.2160	451.1476	(264)
Space and water heating			1325.9298	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	473.6217	0.5190	245.8097	(268)
Energy saving/generation technologies				
PV Unit	-863.6197	0.5190	-448.2186	(269)
Total CO2, kg/year			1162.4459	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.2300	(273)

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

DER		13.2300	ZC1
Total Floor Area	TFA	87.8600	
Assumed number of occupants	N	2.5953	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		15.8555	ZC2
CO2 emissions from cooking, equation (L16)		2.0634	ZC3
Total CO2 emissions		31.1489	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		31.1489	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	87.8600 (1b)	x	2.3800 (2b)	=	209.1068	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.8600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	209.1068	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1435	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3935	(18)
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3640	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4640	0.4549	0.4458	0.4004	0.3913	0.3458	0.3458	0.3367	0.3640	0.3913	0.4095	0.4276	(22b)
Effective ac	0.6077	0.6035	0.5994	0.5801	0.5765	0.5598	0.5598	0.5567	0.5662	0.5765	0.5838	0.5914	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.3100	1.0000	2.3100			(26)
TER Semi-glazed door			8.6200	1.2000	10.3440			(26a)
TER Opening Type (Uw = 1.40)			4.9300	1.3258	6.5360			(27)
External Wall 1	78.2200	15.8600	62.3600	0.1800	11.2248			(29a)
Flat Roof - To Terrace	87.8600		87.8600	0.1300	11.4218			(30)
Total net area of external elements Aum(A, m2)			166.0800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.8366			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.8763	(36)
Total fabric heat loss (33) + (36) =	50.7129	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	41.9324	41.6439	41.3611	40.0328	39.7843	38.6274	38.6274	38.4132	39.0730	39.7843	40.2870	40.8126	(38)
Heat transfer coeff	92.6452	92.3567	92.0739	90.7457	90.4972	89.3403	89.3403	89.1260	89.7859	90.4972	90.9999	91.5255	(39)
Average = Sum(39)m / 12 =												90.7445	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0545	1.0512	1.0480	1.0328	1.0300	1.0168	1.0168	1.0144	1.0219	1.0300	1.0357	1.0417	(40)
HLP (average)												1.0328	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5953	(42)
Average daily hot water use (litres/day)	95.8379	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	105.4217	101.5882	97.7547	93.9212	90.0876	86.2541	86.2541	90.0876	93.9212	97.7547	101.5882	105.4217	(44)
Energy conte	156.3374	136.7337	141.0969	123.0117	118.0326	101.8532	94.3820	108.3047	109.5982	127.7261	139.4230	151.4044	(45)
Energy content (annual)										Total = Sum(45)m =		1507.9037	(45)
Distribution loss (46)m = 0.15 x (45)m	23.4506	20.5100	21.1645	18.4518	17.7049	15.2780	14.1573	16.2457	16.4397	19.1589	20.9135	22.7107	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	50.9589	46.0274	49.8147	46.3173	45.9077	42.5363	43.9542	45.9077	46.3173	49.8147	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	207.2963	182.7611	190.9116	169.3290	163.9403	144.3895	138.3361	154.2124	155.9155	177.5408	188.7381	202.3633	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h													
	207.2963	182.7611	190.9116	169.3290	163.9403	144.3895	138.3361	154.2124	155.9155	177.5408	188.7381	202.3633	(64)
									Total per year (kWh/year) = Sum(64)m =			2075.7338	(64)
Heat gains from water heating, kWh/month													
	64.7219	56.9708	59.3684	52.4807	50.7228	44.5003	42.3705	47.4882	48.0207	54.9226	58.6869	63.0817	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	129.7641	129.7641	129.7641	129.7641	129.7641	129.7641	129.7641	129.7641	129.7641	129.7641	129.7641	129.7641	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	26.8184	23.8199	19.3716	14.6656	10.9627	9.2552	10.0005	12.9991	17.4473	22.1534	25.8563	27.5638	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	235.0851	237.5246	231.3772	218.2903	201.7704	186.2440	175.8714	173.4320	179.5793	192.6663	209.1862	224.7126	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.9764	35.9764	35.9764	35.9764	35.9764	35.9764	35.9764	35.9764	35.9764	35.9764	35.9764	35.9764	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.8112	-103.8112	-103.8112	-103.8112	-103.8112	-103.8112	-103.8112	-103.8112	-103.8112	-103.8112	-103.8112	-103.8112	(71)
Water heating gains (Table 5)													
	86.9918	84.7780	79.7962	72.8899	68.1758	61.8059	56.9497	63.8283	66.6954	73.8207	81.5096	84.7872	(72)
Total internal gains													
	413.8246	411.0516	395.4743	370.7750	345.8381	322.2343	307.7508	315.1885	328.6513	353.5696	381.4813	401.9928	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.5500	10.6334	0.6300	0.7000	0.7700	8.2867	(74)
West	2.3800	19.6403	0.6300	0.7000	0.7700	14.2855	(80)

Solar gains	22.5723	43.7819	72.9322	110.3449	140.4859	146.5404	138.3647	115.0348	85.8802	52.0109	28.0351	18.6560	(83)
Total gains	436.3968	454.8335	468.4065	481.1199	486.3240	468.7747	446.1155	430.2233	414.5315	405.5804	409.5164	420.6487	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.8576	66.0633	66.2662	67.2361	67.4208	68.2938	68.2938	68.4580	67.9549	67.4208	67.0483	66.6633	
alpha	5.3905	5.4042	5.4177	5.4824	5.4947	5.5529	5.5529	5.5639	5.5303	5.4947	5.4699	5.4442	
util living area													
	0.9992	0.9988	0.9978	0.9939	0.9787	0.9179	0.7891	0.8265	0.9613	0.9944	0.9986	0.9994	(86)
MIT	19.7913	19.8760	20.0549	20.3230	20.6004	20.8450	20.9550	20.9404	20.7581	20.4122	20.0656	19.7817	(87)
Th 2	20.0382	20.0409	20.0436	20.0561	20.0584	20.0693	20.0693	20.0713	20.0651	20.0584	20.0537	20.0487	(88)
util rest of house													
	0.9989	0.9984	0.9969	0.9910	0.9666	0.8644	0.6639	0.7129	0.9325	0.9912	0.9980	0.9992	(89)
MIT 2	18.4096	18.5355	18.7992	19.1993	19.6001	19.9355	20.0472	20.0385	19.8262	19.3318	18.8224	18.4033	(90)
Living area fraction									fLA = Living area / (4) =			0.3242	(91)
MIT	18.8575	18.9700	19.2062	19.5635	19.9243	20.2303	20.3415	20.3308	20.1283	19.6821	19.2254	18.8501	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8575	18.9700	19.2062	19.5635	19.9243	20.2303	20.3415	20.3308	20.1283	19.6821	19.2254	18.8501	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9985	0.9978	0.9958	0.9890	0.9643	0.8756	0.7047	0.7492	0.9351	0.9894	0.9972	0.9988	(94)
Useful gains	435.7224	453.8163	466.4295	475.8160	468.9644	410.4615	314.3936	322.3152	387.6165	401.2982	408.3763	420.1243	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1348.6805	1299.4604	1169.9120	967.6709	744.2787	503.0117	334.2635	350.3382	541.2565	821.8999	1103.4075	1340.8577	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	679.2408	568.2729	523.3910	354.1355	204.8338	0.0000	0.0000	0.0000	0.0000	312.9277	500.4225	685.0257	(98)
Space heating												3828.2498	(98)
Space heating per m2											(98) / (4) =	43.5722	(99)

8c. Space cooling requirement

Not applicable

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

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Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.4000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												4098.7686	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	679.2408	568.2729	523.3910	354.1355	204.8338	0.0000	0.0000	0.0000	0.0000	312.9277	500.4225	685.0257	(98)
Space heating efficiency (main heating system 1)													
	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)													
	727.2385	608.4292	560.3758	379.1601	219.3082	0.0000	0.0000	0.0000	0.0000	335.0404	535.7842	733.4322	(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													
	207.2963	182.7611	190.9116	169.3290	163.9403	144.3895	138.3361	154.2124	155.9155	177.5408	188.7381	202.3633	(64)
Efficiency of water heater												80.3000	(216)
(217)m	87.8173	87.7152	87.4599	86.8657	85.6129	80.3000	80.3000	80.3000	80.3000	86.4634	87.3897	87.8794	(217)
Fuel for water heating, kWh/month													
	236.0541	208.3572	218.2848	194.9318	191.4902	179.8125	172.2741	192.0453	194.1662	205.3365	215.9729	230.2740	(219)
Water heating fuel used												2438.9995	(219)
Annual totals kWh/year													
Space heating fuel - main system												4098.7686	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												473.6217	(232)
Total delivered energy for all uses												7086.3898	(238)

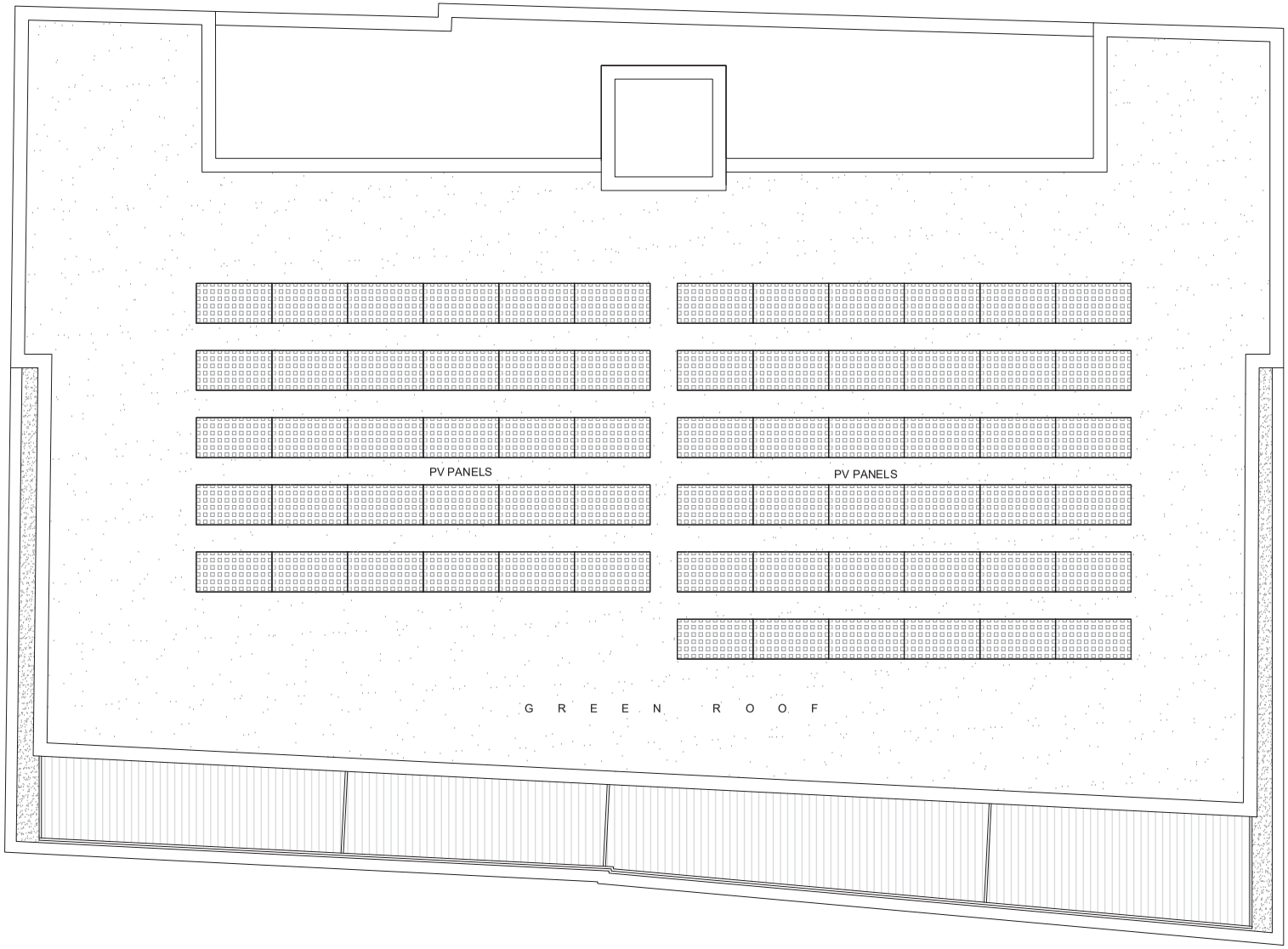
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4098.7686	0.2160	885.3340	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2438.9995	0.2160	526.8239	(264)
Space and water heating			1412.1579	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	473.6217	0.5190	245.8097	(268)
Total CO2, kg/m2/year			1696.8926	(272)
Emissions per m2 for space and water heating			16.0728	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.7977	(272b)
Emissions per m2 for pumps and fans			0.4430	(272c)
Target Carbon Dioxide Emission Rate (TER) = (16.0728 * 1.00) + 2.7977 + 0.4430, rounded to 2 d.p.			19.3100	(273)

Appendix B

Drawing showing PV installation location and panel numbers/array size

NOTES



PROPOSED ROOF PLAN

SCALE 1:100

0 1 2 3 4 5M

1:100

N

drawing status: P L A N N I N G

revision:	description:	date:
P.01	Issued for INFORMATION	17.05.17
P.02	Revised as per comments	09.08.17
P.03	Revised as per comments	29.08.17
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P L A N N I N G

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drawing:	PROPOSED ROOF PLAN		
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