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CAPELLA HOUSE CAR PARK – WORTHING, WEST SUSSEX

ENERGY & SUSTAINABILITY STATEMENT

October 2025

SEC/dc/ss/ES- 3817/-

Southern Energy Consultants
Energy & Sustainability Solutions

About Southern Energy Consultants Ltd

Southern Energy Consultants Ltd are a construction consultancy formed in 2009 specialising in sustainability, energy conservation, suitability of renewable technologies, building regulation compliance services, thermal modelling and overheating modelling. As a consultancy we do not sell or have financial interest in any products so are able to take an objective view of developments to assist Clients with incorporating cost effective, compliant and practical solutions.

Our services include Planning Energy Statements, Planning Sustainability Statements, Energy Calculations for Residential and Commercial Building Regulation compliance, Air Permeability Testing, Sound Testing, psi value Construction Junction Modelling, CIBSE TM52 and TM59 Overheating Modelling, AD Part O Overheating Modelling and Compliance Reports.

Within SEC Ltd we have over fifty years of combined experience working with and for National Developers, Construction and Design and Build Contractors we apply our expertise not only to assist with Client understanding of new energy and sustainability obligations but also in a way that ensures that the needs and responsibilities of all stakeholders are wholly respected and considered.

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1.0 Introduction

1.1 This Energy and Sustainability Statement has been commissioned by Mr J. Rippon (the Applicant) and carried out by Southern Energy Consultants Ltd as part of a comprehensive analysis of the sustainability credentials for the proposed development at Capella House Car Park, Worthing (the Proposed Development), as shown in Fig.1. The Proposed Development (0.06 hectares), which is located on the site of a car park to the north of Railway Approach, includes 29 residential flats within a six storey block. The Proposed Development is bounded by the railway line to the north, the former station building to the west, and a Morrison's service yard to the east.

Fig. 1 – The Development

1.2 The Proposed Development is situated close to a wide range of amenities, services and employment sites within safe walking distance of the site, including a supermarket, chemist, school, post office, place of worship and hospital. A well-connected access road, enhanced pedestrian and cycling infrastructure, excellent rail links, and proximity to the A24 and A27 for strategic road access across West

Sussex and beyond. Worthing Railway Station provides typical off-peak services of two trains per hour to Gatwick Airport and onwards to London Victoria, four trains per hour to Brighton, and two trains per hour to Southampton. In addition, bus stops are located immediately outside the railway station and provide regular services throughout Worthing and the wider coastal region.

1.3 This Statement provides the Applicant's response to the national and local planning policies pertaining to sustainability requirements for the Development, which are described in subsequent paragraphs.

National planning policy

1.4 At a national level, planning policy guidance is espoused within the **National Planning Policy Framework (2024)** (NPPF). The NPPF includes a 'presumption in favour of sustainable development' and sets out three core objectives that all new developments must meet in order to be considered sustainable. These objectives are interdependent and need to be pursued in mutually supporting ways. They are as follows:

a) **Economic** – to help build a strong, responsive and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation and improved productivity; and by identifying and coordinating the provision of infrastructure.

b) **Social** – to support strong, vibrant and healthy communities, by ensuring that a sufficient number and range of homes can be provided to meet the needs of present and future generations; and by fostering well-designed, beautiful and safe places, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being.

c) **Environmental** – to protect and enhance our natural, built and historic environment; including making effective use of land, protecting and improving biodiversity, using natural resources prudently, minimising waste

and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.

1.5 The NPPF places emphasis on the use of renewable energy and/or energy efficiency measures as a tool for meeting the three overarching elements of the government's strategy for delivering sustainable development. The wider environmental and economic benefits of all proposals for renewable energy and/or energy efficiency ventures, irrespective of their scale, are material planning considerations that are given significant weight when determining the success of planning applications. In terms of energy generation, the NPPF asserts that to support the move to a low carbon future, local planning authorities should plan for new development in locations and ways which reduce greenhouse gas emissions and, when setting any local requirement for a building's sustainability, do so in a way consistent with nationally described standards.

1.6 Developments where the principal objective is to conserve or enhance biodiversity will be favoured. Proposals for development are to be permitted where they do not cause harm to biodiversity and where mitigation measures are put in place for the loss of any features of ecological value.

1.7 Local Planning Authorities should ensure that new developments make sufficient provision for waste management and promote designs and layouts that secure the integration of waste management facilities without adverse impact on the street scene or, in less developed areas, the local landscape. The issue of flood risk should be taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas of highest risk. Where new development is, exceptionally, necessary in such areas, development proposals should deliver safe schemes, without increasing flood risk elsewhere and, where possible, reducing flood risk overall.

1.8 More locally, the sustainability agenda is driven by Worthing Borough Council's Local Plan (adopted March 2023) and an accompanying Planning and Climate Change Supplementary Planning Document (update version, December 2023). The

Local Plan sustainability policies (both strategic and development management) of greatest relevance to this Statement are SP1 (Presumption in favour of sustainable development), SP2 (Climate change), SP3 (Healthy communities), DM15 (Sustainable transport and active travel, DM16 (Sustainable travel), DM17 (Energy), DM18 (Biodiversity), DM19 (Green infrastructure), DM20 (Flood risk and sustainable drainage), and DM21 (Water quality and sustainable water use).

1.9 Policy SP1 directly reflects the 'presumption in favour of sustainable development' principle expressed in the NPPF.

1.10 Policy SP2 requires new developments to reduce carbon dioxide emissions, maximise carbon sequestration, and demonstrate climate change mitigation and adaptation. In the case of the former, development proposals are expected to reduce the amount of energy used in construction and operation of buildings and improve energy efficiency, including retrofitting existing properties, to contribute to achieving zero carbon emissions. The Council will support and promote the creation of low carbon heating/cooling networks and the delivery of renewable energy schemes. In addition, new developments are expected to prioritise active travel such as walking, cycling and public transport to reduce reliance on the private car and facilitate car free lifestyles. The waste hierarchy should be adhered to in order to minimise, reuse, and recycle waste during the construction phase and to encourage greater levels of recycling over the lifetime of the development.

1.11 Policy SP3 states that new development must be designed to achieve healthy, inclusive and safe places, which enable and support healthy lifestyles and address health and well-being needs in Worthing. This includes the provision of green open spaces, high quality and energy efficient homes, and by reducing vulnerabilities to climate change and flooding.

1.12 Policy DM15 asserts that in order to manage the anticipated growth in demand for travel, development proposals which promote an improved and integrated transport network, with a re-balancing in favour of non-car modes as a means of access to jobs, homes, services and facilities, will be encouraged and supported.

1.13 Policy DM16 specifies a need for all planning applications involving major developments to be supported by a Sustainability Statement demonstrating that the minimum standards are met and where possible exceeded. All development is encouraged to exceed these minimum standards where possible. Policy DM16 states that all new build housing must achieve a minimum 20% CO_2 reduction compared to the Building Regulations AD Part L1A 2013 standard through energy efficiency measures, unless superseded by national policy or Building Regulations (*note: AD L 2021 regulatory standards now apply*). Developers will be expected to provide evidence of the level of carbon reduction achieved in the dwellings through submission of SAP calculation reports at the design and built stages.

1.14 Policy DM17 demands that all new housing developments incorporate renewable and low carbon energy production equipment to meet at least 10% of predicted total energy requirements (after carbon dioxide emissions reductions from energy efficiency measures). The development of either renewable or low carbon generating technologies is specifically support by the Council, provided there are not adverse impacts relating to noise, visual blight, or odour.

1.15 Policy DM18 requires new developments to ensure the protection, conservation, and enhancement of biodiversity. If significant harm cannot be avoided (by locating development on an alternative site with less harmful impacts or through design), then such harm should be adequately mitigated. Where it cannot be adequately mitigated then as a last resort such harm must be compensated for. Where it cannot be compensated for, then planning permission should be refused. New developments (excluding change of use and householder) should provide a minimum of 10% net gain for biodiversity, and where possible, this should be delivered onsite.

1.16 Policy DM19 stipulates that opportunities should be taken to incorporate elements of green infrastructure onsite to create, protect, enhance and manage green infrastructure assets and/or networks to achieve environmental net gain. This should be based on up-to date ecological evidence on, and information about, green infrastructure networks and assets to maximise multi-functional benefits.

1.17 Policy DM20 requires development to be directed away from areas of highest risk of flooding from any source and opportunities should be taken to reduce flooding through sustainable drainage systems and natural flood management to deliver multi-functional benefits for people and wildlife. A Flood Risk Assessment is required for all sites, unless they are covering less than 1 hectare and in Flood Zone 1. Surface water runoff rates must be constrained to no more than Greenfield 1 year rates for events up to and including the 100 year incident, plus factor in an allowance for climate change, and always ensure no increase in flows as a result of development.

1.18 Policy DM21 requires new development should protect and enhance groundwater, surface water features and control aquatic pollution. Development will be permitted provided that it does not have an unacceptable impact on the quality and potential yield of local water resources, the water environment and its ecology. Regarding water use, all new residential development must achieve, as a minimum, water use of not more than 110 litres per person per day.

1.19 Linked to each of the strategic and development management policies described above, Worthing Borough Council's Planning and Climate Change Supplementary Planning Document sets a list of mandatory (all developments) and additional expectations (major developments). As the Proposed Development involves more than 10 dwellings, it fulfils the criteria for a 'major development' and thus the Applicant is required to integrate the additional requirements in addition to the mandatory requirements. The full list of criteria and the Applicant's various responses are detailed in a comprehensive checklist in the Appendix to this Statement. The main quantitative targets include delivering a net gain for biodiversity, at least a 10% reduction in carbon dioxide emissions from renewable or low carbon energy generating technologies, an Energy Performance Certificate rating of at least 'B' for all new dwellings, and internal potable water efficiency of less than 110 litres per person per day.

1.20 An additional Sustainable Economy Supplementary Planning Document (adopted 2012) also exists, however, this is considered to carry little material weight in panning applications today, and in relation to sustainability requirements, to have

been superseded by Worthing Borough Council's Planning and Climate Change Supplementary Planning Document (December 2023 version).

Structure

1.21 Section 2 of this Statement responds to national and local planning policies relating to sustainable energy development, outlines the Applicant's energy efficiency and renewable/low carbon energy measures for complying with and bettering the regulatory baseline for carbon dioxide emissions standard. Sections 3 to 7 of this Statement then articulate the Applicant's general commitments with respect to maximising the overall sustainability performance of the scheme, which includes a response to the water efficiency and biodiversity standards. The Appendix to this Statement provides a checklist with a comprehensive response to all mandatory and additional sustainability criteria outlined in Worthing Borough Council's Planning and Climate Change Supplementary Planning Document. In addition, example SAP calculations on exemplar apartments are provided, demonstrating the level of reduction in carbon dioxide emissions that will be delivered via the Applicant's proposed energy strategy. A water efficiency calculation is also included as an Appendix item, demonstrating adherence to the not more than 110 litres per person per day target.

2.0 Emissions Baseline, Energy Efficiency Proposals, and Renewable Energy Technologies

Building Regulations (2021) Baseline

2.1 In order for an energy assessment to be conducted, a baseline for carbon dioxide emissions and energy demand must first be calculated for the 29 dwellings in accordance with the requirements of Approved Document L Volume 1; Dwellings 2021 edition incorporating 2023 amendments (AD L 2021) of the Building Regulations. Although it is noted that Local Plan Policy DM16 refers to a baseline calculated in accordance with Part L of 2013 Building Regulations, this is out of date and no longer relevant to developments constructed in 2025 and subsequent years. The predicted baseline emissions from the proposed dwellings includes all sources from hot water, space heating and fixed electrical items. The baselines have been calculated by an accredited energy assessor using SAP (10.2) methodology and

Elmhurst Energy approved software. These baselines will then be used as a standard to demonstrate the reductions that will result from energy efficiency measures and renewable/low carbon energy generating technologies. The AD L 2021 baseline for the Proposed Development identifies predicted carbon dioxide emissions of **23,513 kgCO_2/year**. This calculation is described in more detail in Table 1 below.

Table 1: Baseline carbon dioxide emissions and energy demand – Railway Approach, Worthing

Flat type	Number of dwellings	CO_2 emissions (kgCO_2/year)	Total CO_2 emissions (kgCO_2/year)
1B2P	18	798	14,364
2B3P	10	831	8,310
2B4P	1	839	839
TOTAL	**29**		**23, 513**

2.2 This Statement will now continue by detailing the range of best practice energy efficiency measures and renewable energy technologies to contribute to compliance with the baseline scenario.

Best Practice Energy Efficiency Measures

2.3 As a first energy efficiency measure, the proposed dwellings will incorporate sufficient insulation in the building envelope (walls, roofs, floors, and glazing) to achieve average U-values considerably better than the limiting standards demanded by AD L 2021.

2.4 Table 2 overleaf identifies the proposed U-values and compares these with the limiting area-weighted values set by AD L 2021.

Table 2: Insulation Enhancement Proposals for Main Thermal Elements

Thermal Element	Maximum Area-Weighted U-value (W/m²K) Allowable Under AD L 2021	Proposed U-values (W/m²K)	% Improvement Over AD L 2021 Allowable U-Value Standard
Main external walls	0.26	0.18	30.77
Party walls	0.20	0.00	100.00
Roof (flat/terrace)	0.16	0.15	6.25
Ground floor	0.18	0.18	0.00
Windows	1.60	1.30	18.75

2.5 The Applicant intends to meet the U-value performance standards detailed in Table 2 through the insulation measures set out below in Table 3:

Table 3: Fabric Enhancement Construction Specification

Construction Element	U-Value (W/m²K)	Insulation Specification
External walls	0.18	Outer leaf of 100 mm brick, 100 mm Rocksil Rainscreen Slab (thermal conductivity of 0.034 W/m²K), and 100 mm Omnifit Slab 35 (thermal conductivity of 0.034 W/m²K) between lightweight steel frame stud.
Party walls	0.00	Fully filled and edged sealed.
Ground floor	0.18	65 mm screed, 100 mm rigid insulation board (thermal conductivity of 0.019 W/m²K), and 400 mm precast concrete transfer slab.
Roof (flat/terrace)	0.15	Sedum deck/terrace tiles, 150 mm PIR rigid insulation (thermal conductivity of 0.022 W/m²K), and 150 mm PCC plank.
Windows	1.30	Enhanced PVCu double-glazed windows to specialist BFRC approved manufacturers design and specification, 'g' value of 0.46.

2.6 The fabric measures detailed in Tables 2 and 3 will result in a reduced space heating requirement for the Proposed Development. Additionally, in order to enhance energy efficiency, the Applicant will ensure all apartments will benefit from advanced heating controls in the form of room and appliance thermostats, with seven-day multifunctional timers for programming space and water heating. Air tightness standards will be improved by the Applicant adopting bespoke, specifically calculated details for non-repeating thermal bridges. These details will deliver significant improvement over Building Regulations requirements by reducing air leakage loss and convective bypass of insulation. The Applicant will reduce each dwelling's design air permeability from to not more than between 4.0 m^3/hm^2 to further reduce space heating requirements.

2.7 It is not proposed to provide any mechanical cooling to the proposed dwellings. Instead, it is the intention of the Applicant to reduce the need for active cooling as far as possible. This will be achieved through the specification of mainly non-mechanical measures such as good thermal insulation and an airtight build.

2.8 Ventilation to the dwellings will be facilitated via the installation of highly efficient extract fans. Ventilation to all dwellings will be facilitated via the installation of low-energy Vent Axia MVDC extractor fans (dMEV System 3), which incorporate SMART Technology to reduce heat loss and automatically sense humidity levels in kitchens, bathrooms and WCs. Openable windows will be installed as a necessary fixture to facilitate natural ventilation. These will help facilitate passive solar gains, cross-ventilation, convective-ventilation and night purging. As is required by Part O of 2021 Building Regulations, an overheating assessment will be undertaken to ascertain and mitigate for any such risks.

2.9 All internal lighting throughout the development will be low energy LED. Although not assessed under AD L 2021, external lighting will also be low energy, and some will be controlled through PIR sensors or daylight cut-off devices.

Feasibility of Renewable and Low Carbon Energy Generating Technologies

2.10 A wide-ranging feasibility study was undertaken into the suitability of various renewable and low carbon energy generating technologies. This covered:

- District heating / CHP
- Biomass
- Heat pumps (ground source and air source)
- Hydroelectric power
- Wind energy
- Solar thermal panels
- Solar photovoltaic panels

District heating/CHP

2.11 The Applicant has conducted a detailed review of the feasibility of installing district heating or Combined Heat and Power infrastructure (CHP) to serve the Proposed Development. CHP is a form of district heating that generally uses gas to generate electricity for local consumption, reducing the need for grid electricity and its associated high carbon dioxide emissions. As the CHP system is close to the point of energy demand, it is possible to use the heat that is generated during the electricity generation process. While CHP would enable reductions in carbon dioxide emissions beyond the baseline case, the following reasons make it unsuited to this development:

- Diversity and extent of heat demand – CHP is best suited to developments where there is a diversity of energy demand. A mixed-use scheme built out in a single phase, or a very large residential scheme (>1,000 homes) will have extended periods of the day in which there is a continuous demand for heat. In these circumstances, the district heating network and CHP engine can operate consistently to generate electricity, with heat as a by-product. On a small-sized, entirely residential phase such as the Proposed Development, heat demand would be very low and not continuous, especially during the working day, leading to an over-generation and subsequent dumping of heat.

- Distributional heat losses – thermal stores are a source of standing heat losses, as are even the best insulated distribution networks. When communal systems satisfy only a small and intermittent demand, these standing losses will represent a large part (>30%) of total demand. Carbon dioxide emissions savings gained within the proposed dwellings through association with CHP may be considerably reduced by the additional heat losses associated with the network.
- Plant room size and location – to incorporate a central plant room would require a considerable amount of space, which does not exist based upon the proposed plans.
- Minimised heat demands – the Applicant's proposed energy strategy is based on the adoption of best practice standards for energy efficiency, an approach resulting in reduced space heating demands, which reduces the suitability of any district heating scheme.
- Installed costs – the installed costs of any CHP / district heating network benefit from economies of scale. However, pipe run costs remain approximately £1,000 per metre, and total costs for CHP infrastructure across the site – predominantly from the plant room, CHP engine and pipe runs – would likely extend beyond £4 million for a scheme of this scale.
- Running costs – the fixed costs associated with the management and operation of a communal plant room would need to be shared by future occupants as part of an energy standing charge. The smaller the scheme, the greater the cost for the individual occupant, a particularly unfair situation in the light of the recent 'cost of living' crisis. In addition, CHP engines impose additional running costs as contracts for maintenance and replacement costs are typically handled by specialist companies.
- Absence of other local infrastructure – there are no other CHP / district heating networks in close vicinity of the Proposed Development with which to forge a connection to serve the development.
- Fossil Fuel Lock-in – As the National Electricity Grid continues its journey towards 100% renewable energy, a gas fired development, no matter how energy efficient, would still contribute to substantial greenhouse gas

emissions over its lifetime and not accord with the UK Government's priority of decarbonising heat in homes.

Biomass

2.12 Biomass community heating is an alternative to conventional fossil fuel heating but, as per the reasons used against the installation of gas-fuelled CHP or district heating, with the exception of fossil-fuel lock-in, , should be discounted as an option for the Proposed Development. Biomass boilers within individual dwellings are usually installed with a standard gas boiler as back-up in case the occupier runs out of fuel. Although they are reducing in size, they are still large enough to require a dedicated room with additional space for the fuel – there is insufficient space available for such infrastructure in all of the proposed apartments. The management of fuel deliveries and ash dispersal would also be complex, necessitating a dedicated operative as opposed to residents of the future dwellings. Furthermore, the emissions of Nitrous Oxide and particulate matter that are associated with biomass installations would have the capacity to worsen local air pollution.

Ground and Air Source Heat Pumps (GSHPs and ASHPs)

2.13 Although GSHPs require considerable land area for deployment, which is not available in the space-constrained Proposed Development, ASHPs can be either affixed to a property or located internally, providing space and hot water heating. In addition, ASHPs provide an efficient form of heating during summer and winter months due to a very high seasonal coefficient of performance, which is typically around 2.8. This means that a heat pump provides heating which is 280% efficient, as compared to a modern gas boiler which typically has a SEDBUK (2009) efficiency of at least 85-90%. Maintenance requirements are low and there is no requirement on the part of the future homeowner to store fuel, as would be the case with a biomass boiler. Although ASHPs have traditionally been thought of as a 'noisy technology', technological advancements mean that modern systems rarely emit any more noise than a domestic fridge-freezer. Decarbonising heat in homes underpins the UK's Heat & Buildings Clean Growth Strategies and the Applicant proposes internal Integrated Heat Pumps (IHP's) for all proposed dwellings, with

the technology presenting zero visual impact to surroundings the technology has been deemed suitable for all dwellings at the Proposed Development.

Hydroelectric power

2.14 Hydroelectric power plants generate electricity using the gravitational force of flowing or falling water. However, there are no rivers of sufficient scale in the vicinity of the Proposed Development to facilitate a hydroelectric power installation.

Wind Turbines

2.15 Wind turbines are a modern, high-technology descendant of the windmills that have been around for centuries. In modern windmills the kinetic energy of the wind is used to turn a turbine to generate electricity as opposed to moving water or turning a gristmill wheel. A site with an average wind speed of 5m/s or more is generally considered to be suitable for installing a wind turbine. The average wind speed at the Proposed Development is moderate, around 4.2 m/s at 10m AOD and is below the level required to generate significant carbon dioxide reductions or commercial take-up. The installation of a single, large wind turbine to serve the Proposed Development would also be controversial due to the urban nature of the locality. Even if space could be found within the Proposed Development to accommodate a very high (15-20m) turbine, the installation would then present a significant visual blight to neighbours.

Solar thermal and photovoltaic panels

2.16 Solar thermal heating panels contribute to the hot water demand of a dwelling. Water or glycol (heat transfer liquid) is circulated to roof level where it is heated using solar energy before being returned to a thermal store where heat is exchanged with water from the conventional system. Unfortunately, the technology is unfeasible, as a combination of space constraints in the multiple small apartments, preventing allocation of dedicated solar storage, and the long pipe runs required, resulting in significant heat losses. Regarding solar photovoltaic panels, the proposed dwellings generally contain suitable attributes (suitable orientation, available roof-space and relatively limited shadowing) for solar photovoltaic installations to be designed-in. However, in order to maximise the

sustainability credentials of the site, the applicant is specifying a sedum green roof. Applying solar photovoltaic panels to the green roof would reduce the sedum area, potential shading from the panels would impact plant growth, causing harm to green roof vegetation. In addition, if applying solar photovoltaic panels laid flat on the green roof this would result in an undesirable increase in impermeable area.

Summary of feasible options and emissions reduction outcomes

2.17 The feasibility study has determined that IHP ASHPs are the most suitable option for the Proposed Development, capable of delivering significant reductions in carbon dioxide emissions, not presenting any adverse visual impact to the surroundings, and being a recognised technology to install in space-constrained apartments. The Appendix to this Statement provides illustrative example of SAP calculations for two of the common apartment types: 1B2P and 2B3P. These demonstrate that the Applicant's proposed strategy of best practice energy efficiency measures and IHP ASHPs installed in each of the 29 apartments will deliver significant reductions in carbon dioxide emissions.

2.18 Baseline emissions scenario of **23,513 $kgCO_2$/year** will be reduced to **8,955 $kgCO_2$/year**. This is a reduction of **14,543 $kgCO_2$/year**, or **61.91%**. This outcome is summarised in Table 4 below.

Table 4: Carbon Dioxide Emissions with Energy Efficiency Measures and ASHPs

Apartment type	Number of dwellings	Emissions ($kgCO_2$/year)	Total emissions ($kgCO_2$/year)
1B2P	18	291	5,538
2B3P	10	309	3090
2B4P)	1	327	327
TOTAL	**29**		**8,955**

2.19 The Applicant's energy proposals constitute a '**zero carbon ready**' development. By providing an all-electric scheme for space heating, hot water and electricity generation, the only barrier to full decarbonisation is the current level of renewables supplying the UK's electricity grid. As these continue to increase in the future, the

development's in-use carbon dioxide emissions will continue to trend towards zero with full decarbonisation of the National Electricity Grid targeted for 2030 by the current UK Government.

3.0 Layout, Access, and Landscaping

3.1 The quantum of development and height and scale of the new dwellings has considered the prevailing characteristics of office blocks surrounding the site. Given this, a six-storey block is suitable and constitutes a sensitive development with respect to the current street scene, whilst enabling the land to be maximised with respect to its potential to provide much needed accommodation for people of all ages, including young families and the elderly.

3.2 The Applicant's proposals represent a pedestrian and cycle friendly Proposed Development. As per the Transport Statement compiled by GTA Civils and Transport Ltd (September 2025), communal cycle storage provision will accord with the space requirements set by West Sussex County Council. This amounts to at least 0.5 spaces per 1- or 2-bedroom apartment, and in the case of the Proposed Development, this totals to a minimum allocation of 15 cycle storage spaces. The proposed site layout has provided storage for 24 cycles. A Travel Plan will also be developed and provided to all future building occupants to encourage residents, workers, and visitors to travel via sustainable modes such as walking, cycling and public transport in favour of the private car. This will be achieved by a range of measures implemented by an appointed Travel Plan Coordinator.

3.3 It is important that future residents feel secure and free from the fear of crime. The Applicant and their design team will pay particular attention to the passive surveillance of streets, communal spaces and parking areas. The design proposals also integrate sound urban design principles in locating circulation routes so that they are overlooked by first floor and above windows from habitable rooms, maximising the surveillance of the public realm. Security standards in respect of external doors and windows in the dwellings will comply with the requirements set out in AD Q: Security – Dwellings.

3.4 Access to the Proposed Development's communal spaces will be facilitated in accordance with the principles of inclusive design. A pedestrian friendly environment and carefully designed landscaping will be introduced to ensure that those with mobility difficulties can access all areas of the Proposed Development. The Applicant's commitment to inclusivity will be demonstrated through their attitude towards movement and equality. The Applicant will ensure that the Proposed Development is scaled appropriately so as to respond to the needs of all of its users. They will incorporate the requirements of the Equality Act (2010) into their design, making reasonable adjustments to enable disabled access, regularly reviewing whether the buildings are accessible and effective, and providing necessary design adjustments where it is practicable to do so.

3.5 Future residents will benefit from high speed broadband. All apartments will have the ability to 'house' home office facilities, with sufficient space for a desk, office chair and filing cabinet, as well as the necessary electrical infrastructure located in a suitable position within the property (2 double power sockets, telephone / CAT5 cabling point, etc.).

3.6 The landscaping proposals have placed emphasis on integrating measures to enhance the current ecological value of the site, which, as a car park, is currently negligible. The Ecological Appraisal conducted by LIZARD Landscape Design and Ecology (July 2025) determined that the only feature of ecological value within the current site boundary was an individual tree, which will be protected. Although the very small (0.8 hectares) size of the site means that it is subject to a de minimis exemption, as per the Biodiversity Gain Requirements (Exemptions) Regulations 2024, and thus not required to demonstrate a net gain in biodiversity, the provision of a sedum green is likely to avail multiple biodiversity benefits. These may include the provision of suitable habitats for birds, insects, and various forms of flora.

4.0 Materials

4.1 While a major consideration in materials selection is maintaining a distinct and local architectural style, from a sustainability perspective the Applicant is equally committed to minimising the environmental impact of the materials used over the lifetime of the building – from manufacture to eventual demolition, to disposal. For building materials, the Applicant will, in the main, specify 'A+' or 'A' rated materials using the online BRE Green Guide to Housing Specification, with all materials rated at least 'C'.

4.2 Wherever feasible, the Applicant will commit to using materials that are locally sourced, from renewable sources and recycled. The use of recycled materials (e.g. crushed concrete from waste used for hard-standing or recycled fibreglass insulation) has zero embodied energy impact, other than that expended in their processing or transport.

4.3 The Applicant will also endeavour to employ local labour wherever possible, minimising transport distances and related greenhouse gas emissions.

5.0 Noise and Dust Pollution

5.1 Mitigation measures will be adopted during the M&E design and construction phase to ensure that the baseline ambient noise levels are not overtly increased by the Proposed Development. Although the site is not in an Air Quality Management Zone, as determined within the Air Quality Assessment by Cass Allen Associates Ltd (July 2025), best practice mitigation procedures will still be adopted on-site during the construction phase, which will include the following measures: dampening and sweeping roadways; covering vehicles and skips when loaded with material; locating stock piles to take into account the prevailing wind; sealing and replanting completed earthworks as early as practicable; and using low emission vehicles and plant equipment.

5.2 All recommendations set out in Cass Allen's Air Quality Assessment will be adhered to, helping to minimise fugitive dust and particulate matter emissions to negligible

levels. Air intakes and outlets within the dwellings will all avoid any sources of external pollution in order to avoid internal air pollution.

6.0 Recycling and Waste Management

6.1 The Applicant's proposals have allocated sufficient space within communal bin storage areas to satisfy Worthing Borough Council's waste bin specification for the deposition of general refuse and recyclable waste.

6.2 All apartments will be provided with segregated internal recycling bins in the kitchen to facilitate the recycling of various waste streams.

6.3 The Applicant will ensure that best practice procedures are followed on site in relation to the segregation of various waste streams, setting appropriates targets for reduction, recycling, and re-use with respect to each of these.

7.0 Avoiding Flooding and Water Use

7.1 As per the Flood Risk Assessment and Drainage Statement compiled by GTA Civils and Transport Ltd (September 2025), the site has a very low risk of flooding from fluvial, tidal, groundwater, and surface water runoff sources. However, the Applicant will nevertheless ensure that the Proposed Development does not increase the risk of flooding, either at the site or elsewhere, through provision of a green roof and permeable sub-base beneath the car park, which will aid sustainable drainage, the risk of flooding from surface water runoff will not increase for all storm events up to and including the 1 in 100 year flood (including an allowance for climate change). Thus, rates of surface water runoff will be no more than their pre-development (Greenfield) levels.

7.2 During the construction phase, the Applicant will adopt best practice procedures on site in relation to potential for water pollution. Detailed procedural guidance will be disseminated to site operatives having been prepared in accordance with Environment Agency advice.

7.3 In terms of internal potable water consumption, the Applicant is committed to delivering performance of not more than 110 litres per person per day (see calculation in Appendix), which is lower than the 125 litres per person per day requirement under Approved Document G of the Building Regulations. In order to meet these targets, a combination of reduced-flow taps and showers, dual-flush toilets and moderately sized baths will be installed in all apartments.

8.0 Conclusion

8.1 This Energy and Sustainability Statement has set out the Applicant's detailed energy and sustainability strategy pertaining to the Proposed Development at the Railway Approach, Worthing. The Applicant intends to deliver a sustainable development of 29 dwellings by providing a range of apartments suitable for individuals of all ages – from first-time buyers to small families. The design of the new apartments will reflect the character of other developments in the local area. .

8.2 The sustainability strategy has been developed to comply in full with the planning policy requirements of the NPPF (2024), and Worthing Borough Council's Local Plan (2023), and Planning and Climate Change Supplementary Planning Document (2023). The focus of the sustainable energy strategy has been to first reduce energy consumption at the point of demand by introducing a robust fabric specification and efficient heating and ventilation systems. Secondly, a low carbon energy generating technology, in the form of IHP ASHPs will be provided in each dwelling, which is projected to deliver site-wide carbon dioxide emissions reductions of **63.2%** lower than current regulatory standards. The fully electric Proposed Development constitutes 'zero carbon readiness'.

8.3 In addition, the following sustainable design measures will be adopted:

- Water efficient sanitary devices will be installed to meet a target for internal potable water; consumption of not more than 110 litres per person per day;
- Sustainable Urban Drainage Systems will be specified in the form of a green roof, which will also support local biodiversity;

- Security in dwellings will be incorporated under Part Q of the Building Regulations, helping to reduce the fear and incidence of crime in the new community.
- Cycle storage facilities and a Travel Plan will be developed, helping to encourage the use of sustainable forms of transportation over the private car.
- Priority will be given to the selection of materials with very low lifecycle impacts according to the BRE's Green Guide;
- All timber used in the development will be from sustainable sources.
- Waste streams will be identified, reduced and re-used wherever practicable.

Appendix

1.0 Example SAP calculations:

1.11 Type 2B3P (Plot 1) with energy efficiency measures and ASHP
1.12 Type 1B2P (Plot 25) with energy efficiency measures and ASHP

2.0 Climate change and sustainability checklist

3.0 Internal potable water efficiency – Part G calculation

Full SAP Calculation Printout

Property Reference	SECRAI025	**Issued on Date**	06/09/2025
Assessment Reference	001	**Prop Type Ref**	1B2P MF
Property	Cappella House, Railway Approach, Worthing, West Sussex, BN11 1UR		

SAP Rating	85 B	**DER**	4.46	**TER**	13.62
Environmental	97 A	**% DER < TER**			67.25
CO_2 Emissions (t/year)	0.2	**DFEE**	24.51	**TFEE**	27.89
Compliance Check	See BREL	**% DFEE < TFEE**			12.12
% DPER < TPER	37.15	**DPER**	46.18	**TPER**	73.47

Assessor Details	Mr. Stephen Smith	**Assessor ID**	D168-0001
Client	Jez Rippon, Jez Rippon		

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	56.8000 (1b)	x	2.4000 (2b)	=	136.3200	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	56.8000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	136.3200	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2000	(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) =	0.1700	(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	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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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	
Main dwelling								
Opening Type 1			2.1200	1.0000	2.1200			(26)
Opening Type 2			5.4000	0.9615	5.1923			(27)
Heatloss Floor 1			56.8000	0.1800	10.2240	75.0000	4260.0000	(28a)
Brick Faced	10.4000	5.4000	5.0000	0.1800	0.9000	0.0000	0.0000	(29a)
Communal	16.4000	2.1200	14.2800	0.1800	2.5704	0.0000	0.0000	(29a)
Total net area of external elements Aum(A, m2)			83.6000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0067			(33)
Main dwelling								
Party Wall 1			12.5000	0.0000	0.0000	20.0000	250.0000	(32)
Party Ceiling 1			56.8000			20.0000	1136.0000	(32b)
Internal Wall 1			87.7900			9.0000	790.1100	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	6436.1100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		113.3118 (35)
Thermal bridges (User defined value 0.050 * total exposed area)		4.1800 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 25.1867 (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	22.4928	22.4928	22.4928	22.4928	22.4928	22.4928	22.4928	22.4928	22.4928	22.4928	22.4928	22.4928	(38)
Heat transfer coeff	47.6795	47.6795	47.6795	47.6795	47.6795	47.6795	47.6795	47.6795	47.6795	47.6795	47.6795	47.6795	(39)
Average = Sum(39)m / 12 =												47.6795	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8394	0.8394	0.8394	0.8394	0.8394	0.8394	0.8394	0.8394	0.8394	0.8394	0.8394	0.8394	(40)
HLP (average)												0.8394	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8899 (42)

Hot water usage for mixer showers	55.9065	55.0663	53.8420	51.4996	49.7709	47.8431	46.7473	47.9623	49.2942	51.3641	53.7569	55.6923 (42a)
Hot water usage for baths	24.1648	23.8060	23.3006	22.3687	21.6710	20.8973	20.4794	20.9812	21.5277	22.3555	23.3066	24.0831 (42b)
Hot water usage for other uses	33.9842	32.7484	31.5126	30.2768	29.0410	27.8052	27.8052	29.0410	30.2768	31.5126	32.7484	33.9842 (42c)
Average daily hot water use (litres/day)												104.8432 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	114.0554	111.6206	108.6552	104.1451	100.4829	96.5456	95.0320	97.9846	101.0987	105.2322	109.8118	113.7596	(44)
Energy conte	180.6359	158.9463	166.9989	142.5694	135.2693	118.7141	114.9329	121.3254	124.6648	142.7991	156.4470	178.1200	(45)
Energy content (annual)										Total = Sum(45)m =		1741.4232	
Distribution loss (46)m = 0.15 x (45)m	27.0954	23.8419	25.0498	21.3854	20.2904	17.8071	17.2399	18.1988	18.6997	21.4199	23.4671	26.7180	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3200	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7128	(55)
Total storage loss	22.0968	19.9584	22.0968	21.3840	22.0968	21.3840	22.0968	22.0968	21.3840	22.0968	21.3840	22.0968	(56)
If cylinder contains dedicated solar storage	22.0968	19.9584	22.0968	21.3840	22.0968	21.3840	22.0968	22.0968	21.3840	22.0968	21.3840	22.0968	(57)
Primary 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	(59)
Combi 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	(61)
Total heat required for water heating calculated for each month	202.7327	178.9047	189.0957	163.9534	157.3661	140.0981	137.0297	143.4222	146.0488	164.8959	177.8310	200.2168	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
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	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	202.7327	178.9047	189.0957	163.9534	157.3661	140.0981	137.0297	143.4222	146.0488	164.8959	177.8310	200.2168	(64)
										Total per year (kWh/year) = Sum(64)m =		2001.5952	(64)
12Total per year (kWh/year)												2002	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	60.0615	52.8496	55.5271	47.4043	44.9770	39.4724	38.2152	40.3407	41.4510	47.4807	52.0186	59.2249	(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	94.4935	94.4935	94.4935	94.4935	94.4935	94.4935	94.4935	94.4935	94.4935	94.4935	94.4935	94.4935	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	99.6076	110.2798	99.6076	102.9278	99.6076	102.9278	99.6076	99.6076	102.9278	99.6076	102.9278	99.6076	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	164.8107	166.5209	162.2112	153.0364	141.4548	130.5697	123.2978	121.5876	125.8973	135.0721	146.6537	157.5388	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.4494	32.4494	32.4494	32.4494	32.4494	32.4494	32.4494	32.4494	32.4494	32.4494	32.4494	32.4494	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-75.5948	-75.5948	-75.5948	-75.5948	-75.5948	-75.5948	-75.5948	-75.5948	-75.5948	-75.5948	-75.5948	-75.5948	(71)
Water heating gains (Table 5)	80.7278	78.6453	74.6333	65.8394	60.4530	54.8228	51.3645	54.2214	57.5709	63.8182	72.2481	79.6033	(72)
Total internal gains	396.4941	406.7940	387.8001	373.1516	352.8634	339.6684	325.6180	326.7646	337.7441	349.8459	373.1777	388.0978	(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	
Southwest	5.4000	36.7938	0.4500	0.0000	0.7700	68.8449	(79)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	68.8449	117.2684	160.4517	198.8075	222.6810	221.0706	213.1357	195.3250	173.7353	129.6066	82.4604	58.9169	(83)
Total gains	465.3390	524.0625	548.2518	571.9591	575.5444	560.7391	538.7537	522.0896	511.4794	479.4525	455.6381	447.0147	(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	37.4964	37.4964	37.4964	37.4964	37.4964	37.4964	37.4964	37.4964	37.4964	37.4964	37.4964	37.4964	
alpha	3.4998	3.4998	3.4998	3.4998	3.4998	3.4998	3.4998	3.4998	3.4998	3.4998	3.4998	3.4998	
util living area													

	0.9304	0.8983	0.8581	0.7811	0.6676	0.5127	0.3805	0.4081	0.5864	0.7907	0.8966	0.9381	(86)
MIT	19.6587	19.9040	20.1845	20.5195	20.7816	20.9347	20.9823	20.9770	20.8928	20.5689	20.0615	19.5910	(87)
Th 2	20.2193	20.2193	20.2193	20.2193	20.2193	20.2193	20.2193	20.2193	20.2193	20.2193	20.2193	20.2193	(88)
util rest of house	0.9215	0.8860	0.8408	0.7547	0.6283	0.4583	0.3162	0.3431	0.5331	0.7602	0.8821	0.9301	(89)
MIT 2	18.6550	18.9588	19.3044	19.7074	20.0080	20.1674	20.2089	20.2051	20.1288	19.7732	19.1600	18.5706	(90)
Living area fraction										fLA = Living area / (4) =		0.3937	(91)
MIT	19.0501	19.3309	19.6508	20.0271	20.3126	20.4695	20.5134	20.5089	20.4296	20.0864	19.5149	18.9723	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0501	19.3309	19.6508	20.0271	20.3126	20.4695	20.5134	20.5089	20.4296	20.0864	19.5149	18.9723	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9055	0.8699	0.8268	0.7477	0.6332	0.4761	0.3407	0.3676	0.5479	0.7546	0.8668	0.9145	(94)
Useful gains	421.3825	455.8602	453.2991	427.6324	364.4263	266.9766	183.5792	191.9012	280.2612	361.7827	394.9674	408.8135	(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	703.2776	688.0571	627.0247	530.5333	410.6423	279.8543	186.5871	195.9125	301.7902	452.3086	591.9353	704.3362	(97)
Space heating kWh	209.7299	156.0363	129.2518	74.0886	34.3848	0.0000	0.0000	0.0000	0.0000	67.3512	141.8169	219.8689	(98a)
Space heating requirement - total per year (kWh/year)												1032.5284	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	209.7299	156.0363	129.2518	74.0886	34.3848	0.0000	0.0000	0.0000	0.0000	67.3512	141.8169	219.8689	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1032.5284	
Space heating per m2											(98c) / (4) =	18.1783	(99)

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)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	209.7299	156.0363	129.2518	74.0886	34.3848	0.0000	0.0000	0.0000	0.0000	67.3512	141.8169	219.8689	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	209.7299	156.0363	129.2518	74.0886	34.3848	0.0000	0.0000	0.0000	0.0000	67.3512	141.8169	219.8689	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	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)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	202.7327	178.9047	189.0957	163.9534	157.3661	140.0981	137.0297	143.4222	146.0488	164.8959	177.8310	200.2168	(64)
Efficiency of water heater												450.4900	(216)
(217)m	450.4900	450.4900	450.4900	450.4900	450.4900	450.4900	450.4900	450.4900	450.4900	450.4900	450.4900	450.4900	(217)
Fuel for water heating, kWh/month	45.0027	39.7133	41.9756	36.3945	34.9322	31.0990	30.4179	31.8369	32.4200	36.6037	39.4750	44.4442	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	4.4070	3.9805	4.4070	4.2648	4.4070	4.2648	4.4070	4.4070	4.2648	4.4070	4.2648	4.4070	(231)
Lighting	19.5036	15.6465	14.0879	10.3214	7.9726	6.5137	7.2728	9.4535	12.2792	16.1110	18.1973	20.0457	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1032.5284	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												450.4900	
Water heating fuel used												444.3151	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.3120)													
mechanical ventilation fans (SFP = 0.3120)												51.8888	(230a)
Total electricity for the above, kWh/year												51.8888	(231)
Electricity for lighting (calculated in Appendix L)												157.4052	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)

Energy used		0.0000 (237)
Total delivered energy for all uses		1686.1376 (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	1032.5284	0.1554	160.4735	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	444.3151	0.1412	62.7398	(264)
Space and water heating			223.2133	(265)
Pumps, fans and electric keep-hot	51.8888	0.1387	7.1976	(267)
Energy for lighting	157.4052	0.1443	22.7184	(268)
Total CO2, kg/year			253.1294	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.4600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1032.5284	1.5754	1626.6224	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	444.3151	1.5221	676.3108	(278)
Space and water heating			2302.9332	(279)
Pumps, fans and electric keep-hot	51.8888	1.5128	78.4974	(281)
Energy for lighting	157.4052	1.5338	241.4333	(282)
Total Primary energy kWh/year			2622.8640	(286)
Dwelling Primary energy Rate (DPER)			46.1800	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	56.8000	(1b)	x 2.4000	(2b) =	136.3200	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	56.8000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		136.3200	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract 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)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1467 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3967 (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) =	0.3372 (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	0.4299	0.4215	0.4131	0.3709	0.3625	0.3203	0.3203	0.3119	0.3372	0.3625	0.3794	0.3962	(22b)
Effective ac	0.5924	0.5888	0.5853	0.5688	0.5657	0.5513	0.5513	0.5486	0.5569	0.5657	0.5720	0.5785	(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	
Main dwelling								
TER Opaque door			2.1200	1.0000	2.1200			(26)
TER Opening Type			5.4000	1.1450	6.1832			(27)
Heatloss Floor 1			56.8000	0.1300	7.3840			(28a)
Brick Faced	10.4000	5.4000	5.0000	0.1800	0.9000			(29a)
Communal	16.4000	2.1200	14.2800	0.1800	2.5704			(29a)
Total net area of external elements Aum(A, m2)			83.6000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.1576			(33)

Main dwelling
Party Wall 1 12.5000 0.0000 0.0000 (32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 123.3118 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate	6.4400	0.0500	0.3220	
E3 Sill	5.4300	0.0500	0.2715	
E4 Jamb	13.8800	0.0500	0.6940	
E5 Ground floor (normal)	28.6000	0.1600	4.5760	
E16 Corner (normal)	4.8000	0.0900	0.4320	
E7 Party floor between dwellings (in blocks of flats)	28.6000	0.0700	2.0020	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.2975 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.4551 (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	26.6505	26.4891	26.3308	25.5875	25.4484	24.8010	24.8010	24.6812	25.0504	25.4484	25.7298	26.0239	(38)
Heat transfer coeff	54.1056	53.9442	53.7859	53.0426	52.9036	52.2562	52.2562	52.1363	52.5055	52.9036	53.1849	53.4790	(39)
Average = Sum(39)m / 12 =												53.0420	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9526	0.9497	0.9469	0.9338	0.9314	0.9200	0.9200	0.9179	0.9244	0.9314	0.9364	0.9415	(40)
HLP (average)												0.9338	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8899 (42)
Hot water usage for mixer showers

55.9065	55.0663	53.8420	51.4996	49.7709	47.8431	46.7473	47.9623	49.2942	51.3641	53.7569	55.6923	(42a)

Hot water usage for baths

24.1648	23.8060	23.3006	22.3687	21.6710	20.8973	20.4794	20.9812	21.5277	22.3555	23.3066	24.0831	(42b)

Hot water usage for other uses

33.9842	32.7484	31.5126	30.2768	29.0410	27.8052	27.8052	29.0410	30.2768	31.5126	32.7484	33.9842	(42c)

Average daily hot water use (litres/day) 104.8432 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	114.0554	111.6206	108.6552	104.1451	100.4829	96.5456	95.0320	97.9846	101.0987	105.2322	109.8118	113.7596	(44)
Energy conte	180.6359	158.9463	166.9989	142.5694	135.2693	118.7141	114.9329	121.3254	124.6648	142.7991	156.4470	178.1200	(45)
Energy content (annual)										Total = Sum(45)m =		1741.4232	
Distribution loss (46)m = 0.15 x (45)m	27.0954	23.8419	25.0498	21.3854	20.2904	17.8071	17.2399	18.1988	18.6997	21.4199	23.4671	26.7180	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi 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	(61)
Total heat required for water heating calculated for each month	227.2309	201.0320	213.5938	187.6613	181.8642	163.8059	161.5278	167.9203	169.7566	189.3940	201.5389	224.7149	(62)
WWHRS	-25.5581	-22.6038	-23.6694	-19.5992	-18.2657	-15.6301	-14.6507	-15.5796	-16.1715	-19.0644	-21.5977	-25.0848	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
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	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	201.6728	178.4282	189.9244	168.0621	163.5984	148.1758	146.8771	152.3407	153.5851	170.3296	179.9412	199.6301	(64)
									Total per year (kWh/year) = Sum(64)m =			2052.5655	(64)
12Total per year (kWh/year)												2053	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	97.3374	86.5182	92.8031	83.4778	82.2530	75.5459	75.4911	77.6166	77.5245	84.7566	88.0921	96.5008	(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	94.4935	94.4935	94.4935	94.4935	94.4935	94.4935	94.4935	94.4935	94.4935	94.4935	94.4935	94.4935	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	97.0043	107.3976	97.0043	100.2378	97.0043	100.2378	97.0043	97.0043	100.2378	97.0043	100.2378	97.0043	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	164.8107	166.5209	162.2112	153.0364	141.4548	130.5697	123.2978	121.5876	125.8973	135.0721	146.6537	157.5388	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.4494	32.4494	32.4494	32.4494	32.4494	32.4494	32.4494	32.4494	32.4494	32.4494	32.4494	32.4494	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-75.5948	-75.5948	-75.5948	-75.5948	-75.5948	-75.5948	-75.5948	-75.5948	-75.5948	-75.5948	-75.5948	-75.5948	(71)
Water heating gains (Table 5)	130.8298	128.7473	124.7353	115.9414	110.5551	104.9249	101.4666	104.3234	107.6729	113.9202	122.3502	129.7054	(72)
Total internal gains	446.9928	457.0139	438.2989	423.5636	403.3622	387.0804	373.1168	374.2634	385.1561	400.3447	423.5897	438.5965	(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	
Southwest	5.4000	36.7938	0.6300	0.7000	0.7700	60.7212	(79)

Solar gains	60.7212	103.4307	141.5184	175.3482	196.4046	194.9843	187.9857	172.2767	153.2345	114.3130	72.7300	51.9647	(83)
Total gains	507.7141	560.4446	579.8173	598.9118	599.7668	582.0648	561.1024	546.5401	538.3906	514.6577	496.3198	490.5613	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	35.9590	36.0667	36.1728	36.6797	36.7761	37.2317	37.2317	37.3173	37.0549	36.7761	36.5816	36.3804	
alpha	3.3973	3.4044	3.4115	3.4453	3.4517	3.4821	3.4821	3.4878	3.4703	3.4517	3.4388	3.4254	
util living area	0.9329	0.9066	0.8721	0.8011	0.6933	0.5358	0.3988	0.4245	0.6058	0.8005	0.8993	0.9387	(86)
MIT	19.5599	19.7917	20.0797	20.4539	20.7431	20.9237	20.9791	20.9736	20.8779	20.5339	20.0137	19.5277	(87)
Th 2	20.1231	20.1254	20.1278	20.1388	20.1409	20.1505	20.1505	20.1523	20.1468	20.1409	20.1367	20.1323	(88)
util rest of house	0.9233	0.8938	0.8543	0.7732	0.6506	0.4752	0.3259	0.3515	0.5470	0.7678	0.8836	0.9299	(89)
MIT 2	18.4582	18.7471	19.1044	19.5635	19.8969	20.0920	20.1390	20.1370	20.0470	19.6665	19.0357	18.4247	(90)
Living area fraction										fLA = Living area / (4) =		0.3937	(91)
MIT	18.8919	19.1583	19.4883	19.9140	20.2301	20.4194	20.4697	20.4663	20.3741	20.0080	19.4207	18.8589	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8919	19.1583	19.4883	19.9140	20.2301	20.4194	20.4697	20.4663	20.3741	20.0080	19.4207	18.8589	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9070	0.8772	0.8394	0.7653	0.6552	0.4949	0.3537	0.3790	0.5633	0.7622	0.8683	0.9141	(94)
Useful gains	460.4977	491.6097	486.6807	458.3586	392.9924	288.0846	198.4759	207.1619	303.2680	392.2815	430.9693	448.4145	(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	789.5045	769.1518	698.5904	584.2136	451.2702	304.1013	202.2159	212.0029	329.4253	497.7154	655.2757	783.9437	(97)
Space heating kWh	244.7811	186.5083	157.6608	90.6156	43.3587	0.0000	0.0000	0.0000	0.0000	78.4428	161.5006	249.6337	(98a)
Space heating requirement - total per year (kWh/year)												1212.5015	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	244.7811	186.5083	157.6608	90.6156	43.3587	0.0000	0.0000	0.0000	0.0000	78.4428	161.5006	249.6337	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1212.5015	
Space heating per m2										(98c) / (4) =		21.3469	(99)

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 %) 92.3000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	244.7811	186.5083	157.6608	90.6156	43.3587	0.0000	0.0000	0.0000	0.0000	78.4428	161.5006	249.6337	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	265.2016	202.0675	170.8134	98.1751	46.9758	0.0000	0.0000	0.0000	0.0000	84.9868	174.9735	270.4591	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	201.6728	178.4282	189.9244	168.0621	163.5984	148.1758	146.8771	152.3407	153.5851	170.3296	179.9412	199.6301	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.4953	84.1593	83.6453	82.7375	81.5312	79.8000	79.8000	79.8000	79.8000	82.4344	83.8181	84.5622	(217)
Fuel for water heating, kWh/month	238.6793	212.0126	227.0592	203.1269	200.6575	185.6840	184.0565	190.9031	192.4626	206.6243	214.6805	236.0748	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	20.1556	16.1696	14.5589	10.6665	8.2391	6.7314	7.5160	9.7695	12.6897	16.6495	18.8056	20.7158	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-10.8349	-16.4387	-25.4042	-30.7802	-35.1830	-33.5869	-33.1961	-30.3513	-25.6871	-19.7573	-12.3231	-9.2379	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-3.0262	-6.5752	-13.4696	-20.8324	-28.1427	-28.4892	-28.1374	-23.5309	-16.8805	-9.5768	-4.0955	-2.3766	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1313.6528	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2492.0212	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												162.6671	(232)

Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-467.9137	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3586.4273	(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	1313.6528	0.2100	275.8671	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2492.0212	0.2100	523.3244	(264)
Space and water heating			799.1915	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	162.6671	0.1443	23.4779	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-282.7807	0.1331	-37.6308	
PV Unit electricity exported	-185.1330	0.1251	-23.1530	
Total			-60.7838	(269)
Total CO2, kg/year			773.8149	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.6200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1313.6528	1.1300	1484.4276	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2492.0212	1.1300	2815.9839	(278)
Space and water heating			4300.4115	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	162.6671	1.5338	249.5042	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-282.7807	1.4917	-421.8332	
PV Unit electricity exported	-185.1330	0.4590	-84.9801	
Total			-506.8133	(283)
Total Primary energy kWh/year			4173.2032	(286)
Target Primary Energy Rate (TPER)			73.4700	(287)

Full SAP Calculation Printout

elmhurst energy

Property Reference	SECRAI001	**Issued on Date**	06/09/2025
Assessment Reference	001	**Prop Type Ref**	2B3P GF
Property	Cappella House, Railway Approach, Worthing, West Sussex, BN11 1UR		

SAP Rating	79 C	**DER**	5.71	**TER**	14.42
Environmental	96 A	**% DER < TER**			60.40
CO_2 Emissions (t/year)	0.3	**DFEE**	33.93	**TFEE**	35.96
Compliance Check	See BREL	**% DFEE < TFEE**			5.65
% DPER < TPER	23.88	**DPER**	58.89	**TPER**	77.37

Assessor Details	Mr. Stephen Smith	**Assessor ID**	D168-0001
Client	Jez Rippon, Jez Rippon		

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	65.9000 (1b)	x	2.4500 (2b)	=	161.4550	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.9000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	161.4550	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2000	(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) =	0.1700	(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	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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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	
Main dwelling								
Opening Type 1			2.1200	1.0000	2.1200			(26)
Opening Type 2			11.2200	0.9615	10.7885			(27)
Heatloss Floor 1			65.9000	0.1800	11.8620	75.0000	4942.5000	(28a)
Brick Faced	55.4650	11.2200	44.2450	0.1800	7.9641	9.0000	398.2050	(29a)
Communal	2.6000	2.1200	0.4800	0.1800	0.0864	0.0000	0.0000	(29a)
Total net area of external elements Aum(A, m2)			123.9650					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.8210			(33)
Main dwelling								
Party Wall 1			12.5000	0.0000	0.0000	20.0000	250.0000	(32)
Party Ceiling 1			65.9000			20.0000	1318.0000	(32b)
Internal Wall 1			87.7900			9.0000	790.1100	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7698.8150 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		116.8257 (35)
Thermal bridges (User defined value 0.050 * total exposed area)		6.1983 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 39.0192 (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	26.6401	26.6401	26.6401	26.6401	26.6401	26.6401	26.6401	26.6401	26.6401	26.6401	26.6401	26.6401	(38)
Heat transfer coeff	65.6593	65.6593	65.6593	65.6593	65.6593	65.6593	65.6593	65.6593	65.6593	65.6593	65.6593	65.6593	(39)
Average = Sum(39)m / 12 =												65.6593	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9963	0.9963	0.9963	0.9963	0.9963	0.9963	0.9963	0.9963	0.9963	0.9963	0.9963	0.9963	(40)
HLP (average)												0.9963	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1426 (42)

Hot water usage for mixer showers

60.1445	59.2406	57.9235	55.4035	53.5438	51.4699	50.2911	51.5982	53.0310	55.2578	57.8320	59.9141	(42a)

Hot water usage for baths

25.9873	25.6014	25.0579	24.0558	23.3054	22.4734	22.0239	22.5636	23.1513	24.0416	25.0643	25.8995	(42b)

Hot water usage for other uses

36.5727	35.2428	33.9129	32.5829	31.2530	29.9231	29.9231	31.2530	32.5829	33.9129	35.2428	36.5727	(42c)

Average daily hot water use (litres/day) 112.7935 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	122.7045	120.0848	116.8943	112.0422	108.1022	103.8664	102.2381	105.4148	108.7652	113.2122	118.1391	122.3862	(44)
Energy conte	194.3340	170.9992	179.6622	153.3802	145.5264	127.7158	123.6481	130.5256	134.1184	153.6279	168.3107	191.6272	(45)
Energy content (annual)										Total = Sum(45)m =		1873.4758	

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

29.1501	25.6499	26.9493	23.0070	21.8290	19.1574	18.5472	19.5788	20.1178	23.0442	25.2466	28.7441	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3200 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7128 (55)

Total storage loss

22.0968	19.9584	22.0968	21.3840	22.0968	21.3840	22.0968	22.0968	21.3840	22.0968	21.3840	22.0968	(56)

If cylinder contains dedicated solar storage

22.0968	19.9584	22.0968	21.3840	22.0968	21.3840	22.0968	22.0968	21.3840	22.0968	21.3840	22.0968	(57)
Primary 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	(59)
Combi 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	(61)

Total heat required for water heating calculated for each month

216.4308	190.9576	201.7590	174.7642	167.6232	149.0998	145.7449	152.6224	155.5024	175.7247	189.6947	213.7240	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
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	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

216.4308	190.9576	201.7590	174.7642	167.6232	149.0998	145.7449	152.6224	155.5024	175.7247	189.6947	213.7240	(64)
									Total per year (kWh/year) = Sum(64)m =		2133.6478	(64)
12Total per year (kWh/year)											2134	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

64.6160	56.8572	59.7377	50.9989	48.3875	42.4655	41.1130	43.3998	44.5944	51.0813	55.9633	63.7161	(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	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	100.1403	110.8696	100.1403	103.4783	100.1403	103.4783	100.1403	100.1403	103.4783	100.1403	103.4783	100.1403	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	187.5455	189.4917	184.5875	174.1470	160.9678	148.5812	140.3062	138.3601	143.2643	153.7047	166.8839	179.2705	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	(71)
Water heating gains (Table 5)	86.8495	84.6090	80.2926	70.8318	65.0370	58.9799	55.2594	58.3330	61.9366	68.6577	77.7268	85.6399	(72)
Total internal gains	429.6748	440.1096	420.1597	403.5966	381.2845	366.1788	350.8453	351.9728	363.8186	377.6421	403.2285	420.1901	(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	7.8200	10.6334	0.4500	0.0000	0.7700	28.8126	(74)
Southeast	3.4000	36.7938	0.4500	0.0000	0.7700	43.3468	(77)

Solar gains 72.1594	128.8979	194.5894	275.4633	342.6585	355.9235	336.5425	283.5181	221.8835	147.1486	87.4635	61.1154	(83)
Total gains 501.8341	569.0076	614.7492	679.0599	723.9430	722.1022	687.3878	635.4909	585.7021	524.7907	490.6920	481.3055	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	32.5706	32.5706	32.5706	32.5706	32.5706	32.5706	32.5706	32.5706	32.5706	32.5706	32.5706	32.5706
alpha	3.1714	3.1714	3.1714	3.1714	3.1714	3.1714	3.1714	3.1714	3.1714	3.1714	3.1714	3.1714

util living area													
	0.9527	0.9300	0.8945	0.8162	0.6921	0.5331	0.4043	0.4506	0.6555	0.8493	0.9301	0.9581	(86)
MIT	19.1740	19.4411	19.8125	20.2907	20.6764	20.8960	20.9675	20.9537	20.7959	20.2998	19.6528	19.1045	(87)
Th 2	20.0864	20.0864	20.0864	20.0864	20.0864	20.0864	20.0864	20.0864	20.0864	20.0864	20.0864	20.0864	(88)
util rest of house													
	0.9457	0.9198	0.8789	0.7892	0.6483	0.4697	0.3262	0.3696	0.5942	0.8209	0.9182	0.9517	(89)
MIT 2	17.9572	18.2914	18.7536	19.3340	19.7783	20.0066	20.0685	20.0593	19.9158	19.3587	18.5628	17.8698	(90)
Living area fraction										fLA = Living area / (4) =		0.4917	(91)
MIT	18.5554	18.8566	19.2742	19.8044	20.2199	20.4439	20.5105	20.4990	20.3485	19.8214	19.0987	18.4768	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5554	18.8566	19.2742	19.8044	20.2199	20.4439	20.5105	20.4990	20.3485	19.8214	19.0987	18.4768	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9306	0.9031	0.8627	0.7800	0.6551	0.4953	0.3631	0.4071	0.6128	0.8116	0.9024	0.9374	(94)
Useful gains	467.0077	513.8654	530.3722	529.6613	474.2236	357.6306	249.5601	258.6767	358.8991	425.8950	442.8174	451.1606	(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	936.0010	916.3813	838.7461	715.9720	559.4080	383.7038	256.7598	269.1397	410.2721	605.4689	787.8281	937.4065	(97)
Space heating kWh	348.9311	270.4907	229.4302	134.1437	63.3772	0.0000	0.0000	0.0000	0.0000	133.6029	248.4077	361.7670	(98a)
Space heating requirement - total per year (kWh/year)												1790.1505	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	348.9311	270.4907	229.4302	134.1437	63.3772	0.0000	0.0000	0.0000	0.0000	133.6029	248.4077	361.7670	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1790.1505	
Space heating per m2											(98c) / (4) =	27.1647	(99)

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)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	348.9311	270.4907	229.4302	134.1437	63.3772	0.0000	0.0000	0.0000	0.0000	133.6029	248.4077	361.7670	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	348.9311	270.4907	229.4302	134.1437	63.3772	0.0000	0.0000	0.0000	0.0000	133.6029	248.4077	361.7670	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	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)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	216.4308	190.9576	201.7590	174.7642	167.6232	149.0998	145.7449	152.6224	155.5024	175.7247	189.6947	213.7240	(64)
Efficiency of water heater												450.4900	(216)
(217)m	450.4900	450.4900	450.4900	450.4900	450.4900	450.4900	450.4900	450.4900	450.4900	450.4900	450.4900	450.4900	(217)
Fuel for water heating, kWh/month	48.0434	42.3889	44.7866	38.7943	37.2091	33.0973	32.3525	33.8792	34.5185	39.0075	42.1085	47.4426	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	5.6211	5.0771	5.6211	5.4398	5.6211	5.4398	5.6211	5.6211	5.4398	5.6211	5.4398	5.6211	(231)
Lighting	19.6079	15.7302	14.1633	10.3766	8.0152	6.5485	7.3117	9.5041	12.3449	16.1971	18.2946	20.1529	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1790.1505	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												450.4900	
Water heating fuel used												473.6282	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.3360)													
mechanical ventilation fans (SFP = 0.3360)												66.1836	(230a)
Total electricity for the above, kWh/year												66.1836	(231)
Electricity for lighting (calculated in Appendix L)												158.2469	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													

Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2488.2093	(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	1790.1505	0.1550	277.4530	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	473.6282	0.1412	66.8899	(264)
Space and water heating			344.3429	(265)
Pumps, fans and electric keep-hot	66.1836	0.1387	9.1805	(267)
Energy for lighting	158.2469	0.1443	22.8399	(268)
Total CO2, kg/year			376.3633	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.7100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1790.1505	1.5738	2817.3398	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	473.6282	1.5222	720.9705	(278)
Space and water heating			3538.3103	(279)
Pumps, fans and electric keep-hot	66.1836	1.5128	100.1226	(281)
Energy for lighting	158.2469	1.5338	242.7244	(282)
Total Primary energy kWh/year			3881.1573	(286)
Dwelling Primary energy Rate (DPER)			58.8900	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	65.9000	(1b)	x 2.4500	(2b) =	161.4550	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.9000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	161.4550	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract 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)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1239	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3739	(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) =	0.3178	(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	0.4052	0.3972	0.3893	0.3496	0.3416	0.3019	0.3019	0.2940	0.3178	0.3416	0.3575	0.3734	(22b)
Effective ac	0.5821	0.5789	0.5758	0.5611	0.5584	0.5456	0.5456	0.5432	0.5505	0.5584	0.5639	0.5697	(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	
Main dwelling								
TER Opaque door			2.1200	1.0000	2.1200			(26)
TER Opening Type			11.2200	1.1450	12.8473			(27)
Heatloss Floor 1			65.9000	0.1300	8.5670			(28a)
Brick Faced	55.4650	11.2200	44.2450	0.1800	7.9641			(29a)
Communal	2.6000	2.1200	0.4800	0.1800	0.0864			(29a)
Total net area of external elements Aum(A, m2)			123.9650					(31)

Fabric heat loss, W/K = Sum (A x U) (26)...(30) + (32) = 31.5848 (33)
Main dwelling
Party Wall 1 12.5000 0.0000 0.0000 (32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 126.8257 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	6.4400	0.0500	0.3220
E3 Sill	5.4300	0.0500	0.2715
E4 Jamb	13.8800	0.0500	0.6940
E5 Ground floor (normal)	28.6000	0.1600	4.5760
E16 Corner (normal)	4.8000	0.0900	0.4320
E7 Party floor between dwellings (in blocks of flats)	28.6000	0.0700	2.0020

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.2975 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 39.8823 (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	31.0137	30.8439	30.6774	29.8955	29.7492	29.0682	29.0682	28.9421	29.3305	29.7492	30.0452	30.3546	(38)
Heat transfer coeff	70.8960	70.7262	70.5597	69.7778	69.6315	68.9505	68.9505	68.8244	69.2128	69.6315	69.9275	70.2369	(39)

Average = Sum(39)m / 12 = 69.7771

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0758	1.0732	1.0707	1.0588	1.0566	1.0463	1.0463	1.0444	1.0503	1.0566	1.0611	1.0658	(40)
HLP (average)												1.0588	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1426 (42)
Hot water usage for mixer showers

60.1445	59.2406	57.9235	55.4035	53.5438	51.4699	50.2911	51.5982	53.0310	55.2578	57.8320	59.9141	(42a)

Hot water usage for baths

25.9873	25.6014	25.0579	24.0558	23.3054	22.4734	22.0239	22.5636	23.1513	24.0416	25.0643	25.8995	(42b)

Hot water usage for other uses

36.5727	35.2428	33.9129	32.5829	31.2530	29.9231	29.9231	31.2530	32.5829	33.9129	35.2428	36.5727	(42c)

Average daily hot water use (litres/day) 112.7935 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	122.7045	120.0848	116.8943	112.0422	108.1022	103.8664	102.2381	105.4148	108.7652	113.2122	118.1391	122.3862	(44)
Energy conte	194.3340	170.9992	179.6622	153.3802	145.5264	127.7158	123.6481	130.5256	134.1184	153.6279	168.3107	191.6272	(45)
Energy content (annual)										Total = Sum(45)m =		1873.4758	
Distribution loss (46)m = 0.15 x (45)m	29.1501	25.6499	26.9493	23.0070	21.8290	19.1574	18.5472	19.5788	20.1178	23.0442	25.2466	28.7441	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi 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	(61)
Total heat required for water heating calculated for each month	240.9289	213.0849	226.2571	198.4721	192.1213	172.8076	170.2430	177.1205	179.2103	200.2228	213.4026	238.2222	(62)
WWHRS	-27.4956	-24.3173	-25.4637	-21.0849	-19.6504	-16.8150	-15.7614	-16.7606	-17.3974	-20.5096	-23.2349	-26.9864	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
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	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	213.4333	188.7676	200.7934	177.3872	172.4709	155.9927	154.4817	160.3599	161.8128	179.7132	190.1676	211.2358	(64)
										Total per year (kWh/year) = Sum(64)m =		2166.6160	(64)
12Total per year (kWh/year)												2167	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	101.8920	90.5258	97.0136	87.0724	85.6635	78.5390	78.3889	80.6757	80.6678	88.3572	92.0368	100.9920	(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	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	97.5356	107.9858	97.5356	100.7868	97.5356	100.7868	97.5356	97.5356	100.7868	97.5356	100.7868	97.5356	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	187.5455	189.4917	184.5875	174.1470	160.9678	148.5812	140.3062	138.3601	143.2643	153.7047	166.8839	179.2705	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	(71)
Water heating gains (Table 5)	136.9516	134.7110	130.3946	120.9339	115.1390	109.0819	105.3615	108.4351	112.0387	118.7597	127.8289	135.7419	(72)
Total internal gains	480.1721	490.3280	470.6571	454.0071	431.7819	413.5894	398.3427	399.4702	411.2292	428.1395	453.6391	470.6875	(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	7.8200	10.6334	0.6300	0.7000	0.7700	25.4127	(74)
Southeast	3.4000	36.7938	0.6300	0.7000	0.7700	38.2319	(77)

Solar gains	63.6446	113.6880	171.6279	242.9586	302.2248	313.9245	296.8305	250.0630	195.7012	129.7850	77.1428	53.9038	(83)
Total gains	543.8167	604.0159	642.2850	696.9657	734.0067	727.5138	695.1732	649.5331	606.9304	557.9245	530.7819	524.5913	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	32.7468	32.8254	32.9028	33.2715	33.3414	33.6707	33.6707	33.7324	33.5431	33.3414	33.2003	33.0541	
alpha	3.1831	3.1884	3.1935	3.2181	3.2228	3.2447	3.2447	3.2488	3.2362	3.2228	3.2134	3.2036	
util living area													
	0.9527	0.9331	0.9019	0.8303	0.7134	0.5530	0.4192	0.4620	0.6658	0.8516	0.9295	0.9572	(86)
MIT	19.1857	19.4318	19.7888	20.2724	20.6603	20.8929	20.9671	20.9546	20.7982	20.3175	19.6900	19.1474	(87)
Th 2	20.0206	20.0228	20.0248	20.0346	20.0364	20.0449	20.0449	20.0465	20.0417	20.0364	20.0327	20.0289	(88)
util rest of house													
	0.9451	0.9225	0.8860	0.8026	0.6673	0.4850	0.3347	0.3754	0.6008	0.8214	0.9166	0.9503	(89)
MIT 2	17.9208	18.2300	18.6758	19.2699	19.7176	19.9652	20.0278	20.0213	19.8775	19.3373	18.5653	17.8781	(90)
Living area fraction										fLA = Living area / (4) =		0.4917	(91)
MIT	18.5427	18.8209	19.2230	19.7628	20.1811	20.4213	20.4896	20.4802	20.3302	19.8192	19.1183	18.5021	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5427	18.8209	19.2230	19.7628	20.1811	20.4213	20.4896	20.4802	20.3302	19.8192	19.1183	18.5021	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9304	0.9065	0.8705	0.7939	0.6747	0.5127	0.3748	0.4158	0.6215	0.8137	0.9017	0.9362	(94)
Useful gains	505.9747	547.5570	559.1340	553.3142	495.2319	372.9826	260.5670	270.0553	377.2189	453.9728	478.5882	491.1388	(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													
	1009.7524	984.5693	897.7315	757.9823	590.5509	401.3825	268.1929	280.8162	431.2087	641.9473	840.4061	1004.5376	(97)
Space heating kWh													
	374.8107	293.6723	251.9165	147.3611	70.9173	0.0000	0.0000	0.0000	0.0000	139.8530	260.5089	381.9687	(98a)
Space heating requirement - total per year (kWh/year)												1921.0084	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	374.8107	293.6723	251.9165	147.3611	70.9173	0.0000	0.0000	0.0000	0.0000	139.8530	260.5089	381.9687	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1921.0084	
Space heating per m2											(98c) / (4) =	29.1504	(99)

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 %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	374.8107	293.6723	251.9165	147.3611	70.9173	0.0000	0.0000	0.0000	0.0000	139.8530	260.5089	381.9687	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	406.0787	318.1715	272.9323	159.6545	76.8335	0.0000	0.0000	0.0000	0.0000	151.5200	282.2415	413.8339	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	213.4333	188.7676	200.7934	177.3872	172.4709	155.9927	154.4817	160.3599	161.8128	179.7132	190.1676	211.2358	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.3091	85.0470	84.5696	83.6469	82.2283	79.8000	79.8000	79.8000	79.8000	83.5038	84.7660	85.3714	(217)
Fuel for water heating, kWh/month													
	250.1883	221.9569	237.4298	212.0665	209.7464	195.4795	193.5861	200.9522	202.7730	215.2156	224.3442	247.4315	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	20.2660	16.2581	14.6386	10.7249	8.2842	6.7683	7.5571	9.8230	12.7592	16.7407	18.9086	20.8292	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-12.5067	-18.9434	-29.2297	-35.3593	-40.3655	-38.5089	-38.0463	-34.7975	-29.4821	-22.7268	-14.2089	-10.6658	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-3.5751	-7.7575	-15.8722	-24.5221	-33.1058	-33.5125	-33.1135	-27.7172	-19.9054	-11.3070	-4.8401	-2.8094	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2081.2659	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2611.1700	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:

Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	163.5580	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-542.8788	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4399.1151	(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	2081.2659	0.2100	437.0658	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2611.1700	0.2100	548.3457	(264)
Space and water heating			985.4115	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	163.5580	0.1443	23.6065	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-324.8409	0.1331	-43.2396	
PV Unit electricity exported	-218.0379	0.1251	-27.2727	
Total			-70.5122	(269)
Total CO2, kg/year			950.4350	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.4200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2081.2659	1.1300	2351.8305	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2611.1700	1.1300	2950.6221	(278)
Space and water heating			5302.4525	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	163.5580	1.5338	250.8707	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-324.8409	1.4919	-484.6195	
PV Unit electricity exported	-218.0379	0.4591	-100.1009	
Total			-584.7204	(283)
Total Primary energy kWh/year			5098.7036	(286)
Target Primary Energy Rate (TPER)			77.3700	(287)

Appendix: Planning and Climate Change Checklist – Railway Approach, Worthing

Note: The site includes more than 10 dwellings and thus constitutes a 'major development'

Policy	Mandatory requirements	Applicant response
SP2a	Development proposals are expected to reduce the amount of energy used in construction and operation of buildings and improve energy efficiency, including retrofitting existing properties, to contribute to achieving zero carbon emissions.	Section 2 of this Statement details the energy efficiency measures and installations of ASHPs that will deliver an estimated 63% reduction in carbon dioxide emissions. This constitutes 'zero carbon ready' performance.
SP2c	Developments should prioritise active travel such as walking, cycling and public transport to reduce reliance on the private car and facilitate car free lifestyles.	The development is located in an urban location, close to bus stops and a railway station. The provision of cycle storage spaces and a planned Travel Plan will further encourage the use of sustainable modes of transport over the private car.
SP2d	Follow the waste hierarchy to minimise, reuse, and recycle waste during the construction phase and to encourage greater levels of recycling over the lifetime of the development.	This will be adhered to during the construction phase, with contractors setting appropriate targets. Internal recycling bins provided in the kitchens of every apartment will support recycling.
SP2e	Incorporate green infrastructure such as street trees and other vegetation into the public realm to support rainwater management through sustainable drainage, reduce exposure to air pollution, moderate surface and air temperature and increase biodiversity.	A sedum green roof is specified, facilitating both sustainable drainage and biodiversity benefits. In addition, it will provide urban cooling and likely make a small contribution to enhancing local air quality.
SP2f	Achieve an overall net gain for biodiversity commensurate with the scale of the development, including a positive contribution to the habitat network through habitat protection, creation and enhancement.	As the development is less than 1 hectare in size, it is legally exempt from this requirement, however, the provision of the green roof is still going to lead to the provision of more suitable habitats for insects, birds, and various forms of flora.
SP2g	Maintain the current level of tree canopy cover across the borough and seek opportunities to increase appropriate species of woodland cover.	The current level of tree cover (one tree) at the site will be maintained.

SP2h	Development must be designed to adapt and mitigate the impacts of climate change and reduce vulnerability, particularly in terms of overheating, flood risk and water supply.	The Applicant's is delivering a 'zero carbon ready' development and the integration of a green roof will provide further local cooling and reduce rates of surface water runoff. The development is situated in Flood Zone 1. An AD Part O overheating assessment will be undertaken for each dwelling at detailed design stage to ensure compliance for overheating risk is mitigated.
SP2i	Ensure buildings and infrastructure are designed to adapt to a changing climate, making efficient use of water, reducing impacts from natural hazards like flooding and heatwaves, while mitigating against and avoiding contributing to the urban heat island effect. This should include maximising opportunities for both natural heating and ventilation.	The Applicant's is delivering a 'zero carbon ready' development and the integration of a green roof will provide further local cooling and reduce rates of surface water runoff. Openable windows in all apartments will provide a natural source of ventilation, whilst the provision of System 3 extra fans will provide a highly efficient source of mechanical ventilation. A Part O compliant assessment will be undertaken to verify that all dwellings in the development are not at risk of overheating.
SP2j	The Council will seek adaptation and mitigation measures which improve the resilience of communities, reduce inequality and bring a range of social benefits.	The sustainable construction measures that are proposed will benefit all future residents equally. All communal areas will be easily accessible for disabled persons.
SP2k	Development must not compromise land that is required to deliver towards a nature recovery network.	The development is taking place on the site of a car park, which has negligible ecological value.
SP3a	i) improve the quality and quantity of open space, informal & formal recreation opportunities and multi-functional green infrastructure assets and networks; ii) improve environmental sustainability resilience and reduce contributors to poor health and mitigating their risks, such as those associated with climate change, flooding, hazardous uses, crime, noise and poor air quality to reduce inequalities and address climate justice;	The provision of a sedum green roof accords with both objectives i) and ii). Regarding crime and fairness, security standards in respect of doors and windows will be very high for all future residents, and fully compliant with Approved Document Q of Building Regulations.

DM15a	Worthing Borough Council will promote and support development that prioritises active travel … and reduces the proportion of journeys made by car… by: ii) ensuring that the design and layout of new development prioritises the needs of pedestrians, cyclists and users of public transport over the ease of access by the motorist iii) ensuring that new development minimises the need to travel and where appropriate, incorporates measures to mitigate for any transport impacts which may arise from that development iv) requiring new development to provide for an appropriate level of cycle parking, car parking and electric vehicle space allocations… v) promoting the provision of, and participation in car club schemes vi) requiring new development which generates a significant demand for travel, and/or is likely to have other transport implications to; ● Be supported by a Transport Assessment / Transport Statement and Sustainable Travel Plan… ● Contribute to improved sustainable transport infrastructure… ● Provide facilities and measures to support sustainable travel modes. vii) ensure new development contributes to the mitigation of air pollution. New development should be located and designed to incorporate facilities for electric vehicle charging points.	The development has been supported by the Transport Statement prepared by GTA Civils and Transport Ltd. This sets out the intended scope of a future Travel Plan, which will be provided to all future residents upon occupation. By providing 24 cycle storage spaces, and in the light of the already advantageous location of the site with regards to bus stops and the railway station, the proposed development is highly permeable. Given the nearby location of various employment, retail and service centres, as well as other amenities, it will be possible for future residents to undertake a high proportion of journeys by transportation modes other than the private car.
DM16d	All new build housing should seek to achieve an A rating (with a minimum expectation of B rating) Energy Performance Certificate. New housing should achieve a minimum of a 'C' rating Energy Performance Certificate.	All new apartments will deliver a minimum of a 'B' rating in their Energy Performance Certificate.

DM16e	All non-domestic properties (including those created through conversions) should achieve a 'B' rating Energy Performance Certificate.	Not applicable.
DM16g	All new development should incorporate design measures where appropriate to minimise excessive solar gain and maximise opportunities for passive cooling through natural ventilation and other passive means to avoid contributing to the urban heat island effect and reduce vulnerability to overheating. Multifunctional green infrastructure should be integrated into public spaces to provide urban cooling and access to shady outdoor space.	Openable windows have been located and sized to make maximum use of opportunities to provide natural forms of ventilation and passive solar gains. The provision of the sedum green roof will also support natural cooling and diminish the potential for the urban heat island.
DM16i	All development will be required to follow the waste hierarchy to minimise the amount of waste disposed to landfill and incorporate facilities that enable and encourage high rates of recycling and re-use of waste and materials.	This will be adhered to during the construction phase, with contractors setting appropriate targets for rates of recycling and reuse of waste. Internal recycling bins provided in the kitchens of every apartment will support recycling.
DM16j	New development should minimise construction waste and maximise the recycling and re-use of demolition materials.	As per Section 6 of the Energy and Sustainability Statement, the Applicant will aspire to minimise, recycle and reuse construction waste, and maximise the recycling and re-use of any demolition materials.
DM17a	All new housing development should incorporate renewable and low carbon energy production equipment to meet at least 10% of predicted total energy requirements (after C02 reductions from energy efficiency measures - see para 5.250).	ASHPs will be specified in every apartment. Together with the best practice energy efficiency measures, a 63.2% reduction in carbon dioxide emissions will be delivered against current regulatory standards. As an all-electric scheme for space heating, hot water and electricity generation, this constitutes 'zero carbon ready' performance.
DM18g	Where relevant, new development adjacent to the coast will have to demonstrate how it is reducing impacts of coastal squeeze.	Not applicable.

DM19b	Opportunities should be taken to incorporate elements of green infrastructure onsite to create, protect, enhance and manage green infrastructure assets and/or networks to achieve environmental net gain. This should be based on up-to date ecological evidence on, and information about, green infrastructure networks and assets to maximise multi-functional benefits.	See responses above regarding the integration of a sedum green roof.
DM19c	In all new developments there should be no net loss of trees and any trees removed should, where practical and appropriate, be replaced on a greater than 1:1 basis to support levels of canopy cover and contribute to biodiversity net gain. Where this is not possible, an off-site contribution may be sought. Where practical and appropriate, additional tree planting is encouraged to improve the quality of the local environment and increase appropriate species canopy cover. Where possible, tree stock should be UK sourced and grown.	The Applicant will ensure that the development does not lead to any net loss in trees.
DM20a	The Council will work with relevant bodies to ensure that flood risk in Worthing is managed and reduced. Development should be directed away from areas of highest risk of flooding from any source and opportunities should be taken to reduce flooding through sustainable drainage systems and natural flood management to deliver multi-functional benefits for people and wildlife.	The development is occurring in Flood Zone 1 and the Applicant, through provision of a green roof, will ensure that surface water runoff rates are no higher than their pre-development Greenfield rates – for all storm events up to and including the 1 in 100 year event, plus an allowance for climate change.
DM20b	A site specific Flood Risk Assessment must be submitted with planning applications for: i) sites of 1 hectare or greater in Flood Zone 1; ii) all new development (including minor development and change of 6 use) in Flood Zones 2 and 3; iii) development that would introduce a more vulnerable class on land at increased flood risk in future or subject	The Flood Risk Assessment prepared by GTA Civils and Transport Ltd. (September 2025) confirms that the site has a low risk of flooding from all conceivable sources.

	to other sources of flooding identified by the Strategic Flood Risk Assessment.	
DM21d	Development must be phased to take into account the timing of any water and/or wastewater infrastructure required which must be in place prior to the occupation of development.	There is no requirement for this small development of 29 apartments to be phased, and as per the Drainage Statement by GTA Civils and Transport Ltd. (September 2025), it will not place any excess burden on wastewater infrastructure.
DM21e	All new residential development must achieve as a minimum the optional requirement set through Building Regulations for water efficiency that requires an estimated water use of no more than 110 litres per person per day.	All apartments will deliver internal potable water use of less than 110 litres per person per day, as evidenced via the calculation in the Appendix.

Southern Energy Consultants
Residential & Commercial Energy Solutions

Job no:	3817
Date:	17/09/2025
Calculated by:	S.R.Smith
Client:	Mr.J.Rippon
Development name:	Capella House

WATER EFFICIENCY CALCULATOR FOR NEW DWELLINGS - (BASIC CALCULATOR)

	House Type:	Type 1		Type 2		Type 3		Type 4		Type 5		Type 6		Type 7		Type 8		Type 9		Type 10	
	Description:	All Plots																			
Installation Type	Unit of measure	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day
Is a dual or single flush WC specified?		Dual		Dual		Select option:		Select option:		Select option:		Select option:		Select option:		Click to Select		Click to Select		Click to Select	
WC	Full flush volume	4	5.84		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
	Part flush volume	2.6	7.70		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Taps (excluding kitchen and external taps)	Flow rate (litres / minute)	5	9.48		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Are both a Bath & Shower Present?		Bath & Shower		Select option:		Select option:		Select option:		Select option:		Select option:		Select option:		Select option:		Select option:		Select option:	
Bath	Capacity to overflow	193	21.23		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Shower	Flow rate (litres / minute)	8	34.96		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Kitchen sink taps	Flow rate (litres / minute)	6	13.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Has a washing machine been specified?		No		Select option:		Select option:		Select option:		Select option:		Select option:		Select option:		Select option:		Select option:		Select option:	
Washing Machine	Litres / kg		17.16		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Has a dishwasher been specified?		No		Select option:		Select option:		Select option:		Select option:		Select option:		Select option:		Select option:		Select option:		Select option:	
Dishwasher	Litres / place setting		4.50		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Has a waste disposal unit been specified?		No	0.00	Select option:	0.00	Select option:	0.00	Select option:	0.00	Select option:	0.00	Select option:	0.00	Select option:	0.00	Select option:	0.00	Select option:	0.00	Select option:	0.00
Water Softener	Litres / person / day		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
	Calculated Use		113.9		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0
	Normalisation factor		0.91		0.91		0.91		0.91		0.91		0.91		0.91		0.91		0.91		0.91
Code for Sustainable Homes	Total Consumption		103.6		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0
	Mandatory level		Level 3/4		-		-		-		-		-		-		-		-		-
Building Regulations 17.K	External use		5.0		5.0		5.0		5.0		5.0		5.0		5.0		5.0		5.0		5.0
	Total Consumption		108.6		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0
	17.K Compliance?		Yes		-		-		-		-		-		-		-		-		-

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