



Crest Nicholson Operations Limited

LAND WEST OF GATESMEAD

Energy and Sustainability Statement
Revision A

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EXECUTIVE SUMMARY

This Energy and Sustainability Statement has been prepared to support the full planning application for the proposed residential development at Land West of Gatesmead.

The proposed development lies within the jurisdiction of Mid Sussex District Council (MSDC). The energy and sustainability statement has been developed in accordance with the Mid Sussex District Local Plan 2014-2031 (Adopted 2018), Mid Sussex Design Guide Supplementary Planning Document SPD, and the National Planning Policy Framework (2024). The Energy and Sustainability Statement for the proposed development demonstrates that the design will holistically incorporate sustainable principles into the full range of sustainability aspects, including Energy and Water Efficiency, Flood Risk, Surface water runoff, Land and Ecology, Waste management, and Sustainable Transport/Accessibility, as set out in the Local Plan.

The Client is committed to minimising the use of fossil fuels wherever possible. As a result, this proposal emphasises the use of electricity, which is increasingly becoming cleaner and greener due to the widespread decarbonization of the grid.

To assess predicted carbon emissions, the SAP 10 fuel carbon factors have been used in line with Building Regulations Part L (2021).

The Energy and Sustainability Statement for the proposed development demonstrates that the design will holistically incorporate sustainable principles into the full range of sustainability aspects covered by the Mid Sussex District Local Plan, including Energy and Water Efficiency, Flood Risk, Surface Water Run-Off, Land and Ecology, Waste management and Sustainable Transport/Accessibility.

The energy strategy has been developed based on the following energy hierarchy.

'Be Lean – Use less energy':

The strategy aims to minimise energy demand through a highly efficient building fabric and services. At the Be Lean stage, the new-build residential dwellings are expected to achieve a 23% reduction in regulated CO₂ emissions.

'Be Clean – Supply energy efficiently':

If a heat network exists nearby, the development should connect to it. Local authorities and heat network operators have been consulted, but after reviewing the Heat Network Planning Database, it was found that the proposed development is too far from any existing or proposed heat network. Consequently, the scheme will proceed with an all-electric system, with provisions to connect to a heat network in the future if one becomes viable.

'Be Green – Supply energy from renewable sources.':

Policy DP39 of the Mid Sussex District Local Plan require that developments minimise energy consumption and incorporate on-site renewable energy solutions where feasible.

A feasibility study was undertaken to assess the suitability of incorporating low and zero-carbon (LZC) technologies on-site. The study identified the following technologies as the most viable for this development:

- Air source heat pump
- Photovoltaic system

A highly optimised energy strategy, based on building fabric performance, building services systems and controls, and appropriate Low and Zero Carbon technologies, will enable the scheme to achieve an 78% reduction in total site-wide CO₂ emissions compared to the baseline set by Building Regulations. This approach is intended to meet the energy performance requirements of the Mid Sussex District Local Plan.

Summary of Sustainability Strategies

- **Sustainable Travel and Transport:** The proposed development is supported by strong transport links via the B2272 and B2112. The site has good accessibility via sustainable modes, with local shops, schools, and health services within walking and cycling distance. The Development also provide parking with electric vehicle charging facilities and cycle provision as per WSCC standards. A Travel Plan and off-site improvements, including upgraded footways, bus stop enhancements, and safe access for service vehicles, aim to encourage sustainable travel while ensuring traffic impacts are robustly assessed.
- **Water:** All dwellings will feature flow control devices and water-efficient fixtures to limit internal water use to less than 110 litres per person per day.
- **Climate change:** The development will be designed to withstand future climate conditions, minimising risks such as flooding, heat island effects and overheating.
- **Biodiversity and landscape:** Although some biodiversity loss is expected, the scheme will implement compensatory measures, including the Planting of new trees and native species, the Installation of bird and bat boxes to enhance ecological value and off-site habitat enhancement.
- **Air quality:** The proposed development's air quality impact is expected to be negligible. The impacts on sensitive receptors during the construction phase will be high and short-term, which can be mitigated by implementing appropriate mitigation measures.
- **Noise:** The noise assessment shows the site is acoustically viable, with background noise limits of 56.3 dB by day and 50.8 dB at night, requiring careful ventilation strategies, acoustic barriers, fencing, and façade design to meet national standards. With these measures, the development can provide a high-quality acoustic environment, and noise is not considered a barrier to planning approval.
- **Land pollution:** The Desk study and site investigation identified a low risk of contamination. The assessment concludes there is no significant contamination, and exposure risks to future residents are negligible. Additional geotechnical, groundwater, and laboratory testing are recommended.
- **FRA and SUDS:** A Flood Risk Assessment confirms the site lies in Flood Zone 1 with low risk from all flooding sources, and infiltration is not feasible due to bedrock consisting of Upper Tunbridge Wells Sand. A sustainable drainage strategy using an attenuation basin and controlled discharge ensures compliance with national and local policies.
- **Material management:** Where practicable, new building materials will be sourced locally to reduce transport-related emissions and support the local economy. New materials will be selected based on their environmental impact, and responsible suppliers will be used where possible.

- Waste management: Adequate facilities will be provided for domestic operational and construction-related wastes, including segregated bins for refuse and recycling.

The Applicant has embraced a sustainable design approach by incorporating efficient Low and Zero-Carbon (LZC) technologies. This ensures compliance with the policies outlined in the adopted local plan and the National Planning Policy Framework (2024).

1.0 INTRODUCTION

- 1.1 Create Consulting Engineers Ltd has been appointed by Crest Nicholson Operations Limited to prepare an Energy and Sustainability Statement in support of a full planning application for the proposed development at Land West of Gatesmead, Haywards Heath.
- 1.2 It has been understood that this is a full planning comprising a residential development of up to 49 new homes, together with open space and associated infrastructure.
- 1.3 This report details the sustainability measures incorporated in the development at Land West of Land West of Gatesmead, Haywards Heath, in line with relevant Local, Regional, and National planning policies.

Site Location and Description

- 1.4 The proposed development lies within the jurisdiction of Mid Sussex District Council (MSDC). The Site lies along the A272, which links to both the A22 and A23, which provide good connectivity to local towns and cities, as well as to the M23 and on to the M25 in the north. Crawley and the nearby Gatwick Airport lie to the north-west.
- 1.5 The site comprises circa 4.5 hectares (ha) of grassland surrounded by vegetation to the north of Old Wickham Lane, a designated Public Right of Way (PROW). It is generally surrounded by residential areas, including the Gates Mead development to the north-east, from which vehicular access will be taken. Haywards Heath Golf Course lies to the north of the site.

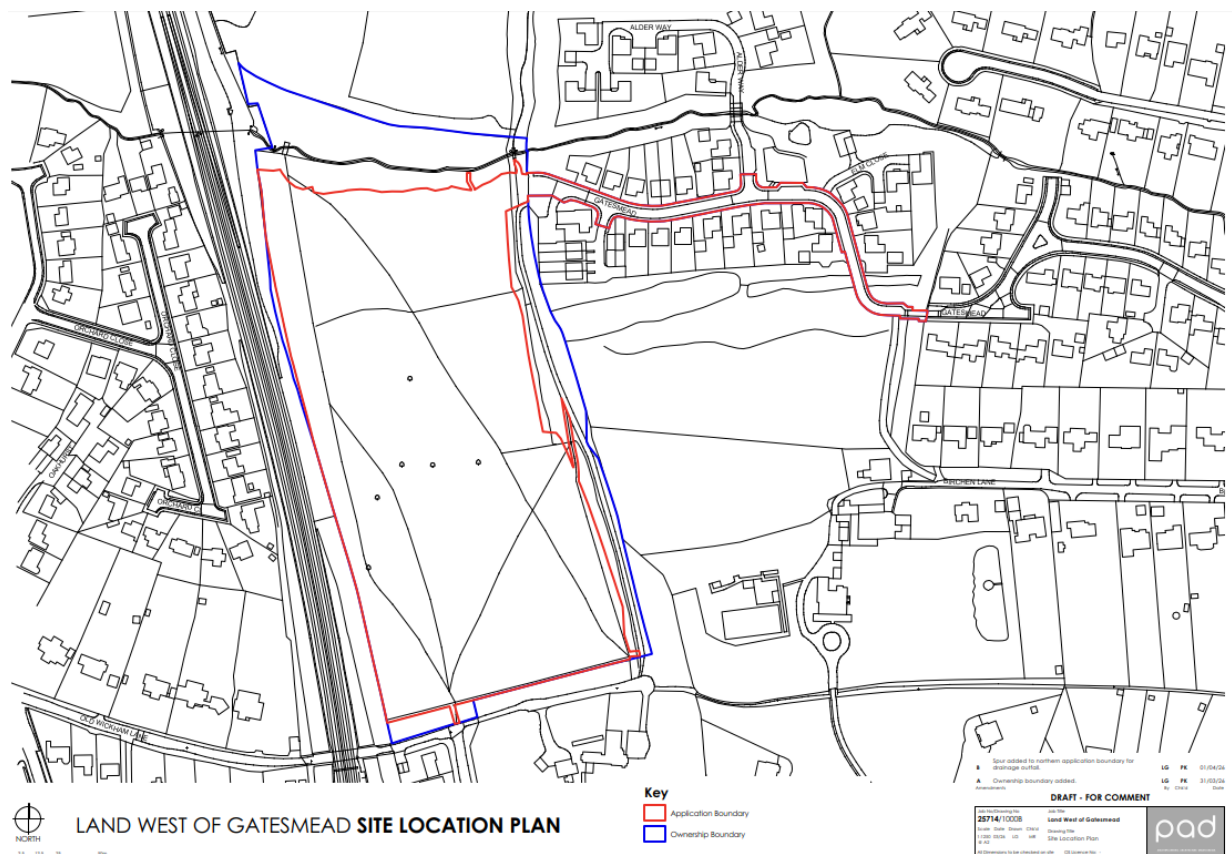


Figure 1.1: Site red line boundary (Source: pad Design Ltd)

- 1.6 The proposed development will comprise the construction of 49 new homes, together with open space and associated infrastructure. The proposed housing mix complies with the requirements set out in draft Policy DPH7 of the Emerging Mid Sussex District Local Plan (2021–2039). Details of the housing mix percentages specified in Policy DPH7 are provided in Table 1.1. The layout and distribution of dwellings across the site are illustrated in Figure 1.2: Proposed Site Masterplan.



Figure 1.2: Proposed Site Masterplan (Source: Pad Design Ltd)

Category	Units
Open Market	34
Affordable – Shared Ownership	4
Affordable – Social/Affordable Rented	11
Grand Total	49

Table 1.1: Housing mix

Objectives

1.7 The objectives of this report are to:

- Demonstrate how the proposed development has been assessed against the policy requirements of the Adopted Mid Sussex District Local Plan 2014 – 2031.
- Adopt the design principle DG37 of sustainable buildings to reduce environmental impacts and deliver high quality buildings.
- Identify the passive and active design measures that are to be adopted to ensure that the design complies with Part L1A 2021 of the Building Regulations.
- Identify the most suitable energy-efficient design approach for the scheme, the feasibility of Low and Zero Carbon technologies, and operational Best Practices.
- Identify the drivers relating to an energy-efficient design over and above minimum compliance with current Building Regulations and energy targets.
- Identify areas for consideration at the initial stages of the project to facilitate the incorporation of the principles of sustainable design and construction, pertaining to energy efficiency and carbon emission reduction, water efficiency, materials efficiency, sustainable waste management and pollution reduction strategy into the design of the development.

Report Structure

1.8 This introductory section is followed by a comprehensive review of national, regional, and local policies on energy, sustainability and best practice standards. Sections 3–5 contain the results of the energy assessment, addressing measures taken to mitigate the effects of climate change and enhance the energy efficiency of the scheme, as well as reducing CO₂ emissions. The remaining Sections 6–12 detail the sustainability strategy for the scheme related to Flood Risk, Surface Water Run-Off, Ecology, Pollution, Sustainable Construction Processes, Materials & Recycling, Sustainable Transport and Accessibility.

2.0 CURRENT AND FUTURE PLANNING POLICIES/GOOD PRACTICE REVIEW AND PROJECT REQUIREMENTS

Climate Change Act 2008 (2050 Target Amendment)

- 2.1 On 26th November 2008, the UK Government published the Climate Change Act 2008, the world's first long-term legally binding framework to mitigate against climate change. The Act initially set legally binding targets for greenhouse gas emissions reduction of 80% by 2080 (from 1990 levels). This was amended in 2019 to a revised target of a 100% reduction in carbon emissions by 2050, over the 1990 baseline emissions levels, known as the net-zero target. In addition, there are interim carbon budget levels, which provide stepping stones to achieve the overall target.

National Planning Policy Framework December 2024

Planning for climate change

- 2.2 Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating and drought from rising temperatures. Policies should support appropriate measures to ensure the future health and resilience of communities and infrastructure to climate change impacts, such as providing space for physical protection measures, or making provision for the possible future relocation of vulnerable development and infrastructure.
- 2.3 The need to mitigate and adapt to climate change should also be considered in preparing and assessing planning applications, taking into account the full range of potential climate change impacts.
- 2.4 New development should be planned for in ways that:
- a) avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through incorporating green infrastructure and sustainable drainage systems; and
 - b) help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings in plans should reflect the Government's policy for national technical standards.
- 2.5 To help increase the use and supply of renewable and low carbon energy and heat, plans should:
- a) provide a positive strategy for energy from these sources, that maximises the potential for suitable development, and their future re-powering and life extension, while ensuring that adverse impacts are addressed appropriately (including cumulative landscape and visual impacts);
 - b) consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and

- c) identify opportunities for development to draw its energy supply from decentralised, renewable or low-carbon energy supply systems and for co-locating potential heat customers and suppliers.

2.6 In determining planning applications, local planning authorities should expect new development to:

- a) comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and
- b) take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.

2.7 Local planning authorities should also give significant weight to the need to support energy efficiency and low-carbon heating improvements to existing buildings, both domestic and non-domestic (including through installation of heat pumps and solar panels where these do not already benefit from permitted development rights). Where the proposals would affect conservation areas, listed buildings or other relevant designated heritage assets, local planning authorities should also apply the policies set out in chapter 16 of this Framework.

2.8 When determining planning applications for all forms of renewable and low carbon energy developments and their associated infrastructure, local planning authorities should:

- a) not require applicants to demonstrate the overall need for renewable or low carbon energy, and give significant weight to the benefits associated with renewable and low carbon energy generation and the proposal's contribution to a net zero future;
- b) recognise that small-scale and community-led projects provide a valuable contribution to cutting greenhouse gas emissions;
- c) in the case of applications for the repowering and life-extension of existing renewable sites, give significant weight to the benefits of utilising an established site.

2.9 Once suitable areas for renewable and low carbon energy have been identified in plans, local planning authorities should expect subsequent applications for commercial scale projects outside these areas to demonstrate that the proposed location meets the criteria used in identifying suitable areas.

Future Home Standard

2.10 The Future Homes Standard (FHS) is a key part of the UK's strategy to achieve net zero carbon emissions by 2050. It aims to significantly improve the energy efficiency of new homes while reducing their carbon footprint. The FHS focuses on decarbonising heating and hot water systems, minimising heat loss, and replacing existing technologies with low-carbon alternatives.

2.11 From 2025 onwards, all new homes in England will be required to meet the FHS, which mandates a 75–80% reduction in carbon emissions compared to homes built to the 2013 Building Regulations. This step change will ensure that new housing developments are fit for a low-carbon future, aligning with national climate commitments.

2.12 Homes built to the FHS are required to be 'zero-carbon ready' and designed so that they won't require retrofitting to benefit from the decarbonisation of the electricity grid and transition of electric heating.

- 2.13 By prioritising high levels of fabric efficiency and integrating low-carbon technologies, the FHS represents a significant move towards sustainable construction practices and the delivery of homes that are both energy-efficient and environmentally responsible.

Local Planning Policy

Mid Sussex District Local Plan 2014-2031 (Adopted in 2018)

- Policy DPI: Sustainable Economic Development

Strategic Objectives:

- 7) To promote a place which is attractive to a full range of businesses, and where local enterprise thrives; and*
- 8) To provide opportunities for people to live and work within their communities, reducing the need for commuting.*

Evidence Base: Burgess Hill Employment Sites Study; Coast to Capital Strategic Economic Plan; Gatwick Diamond Strategy; Mid Sussex Economic Development Strategy, Northern West Sussex Economic Growth Assessment; Housing and Economic Development Needs Assessment.

The total number of additional jobs required within the district over the plan period is estimated to be an average of 543 jobs per year. This will be achieved by:

- Encouraging high quality development of land and premises to meet the needs of 21st century businesses;*
- Supporting existing businesses, and allowing them room to expand;*
- Encouraging inward investment, especially the location, promotion and expansion of clusters or networks of knowledge, creative or high technology industries; and*
- Seeking the provision of appropriate infrastructure to support business growth – in particular high speed broadband connections.*

Provision for new employment land and premises will be made by:

- Allocating 25 hectares of land as a high-quality business park at Burgess Hill to the east of Cuckfield Road;*
- Allocating further sites within the Site Allocations DPD;*
- Incorporating employment provision within large scale housing development as part of a mixed use development where it is appropriate; and*
- Allowing new small-scale economic development, in the countryside, including tourism (in accordance with Development in the Countryside policies).*

The development of a Science and Technology Park has been proposed to support research and development and provide high quality employment for the wider area. The Coast to Capital Strategic Economic Plan identifies a broad location to the west of Burgess Hill. This broad location is indicated on the Policies Map. The Council would consider any such proposals taking into account:

- how the proposal demonstrates that it would contribute to meeting the overall objectives of this policy;*
- how the proposal demonstrates that the development would comprise uses falling within the definition of a 'Science Park' as set out by the UK Science Park Association, alongside appropriate ancillary uses required to serve the development and its employees;*

- *how the proposal would secure the objectives of policy DP21: Transport, particularly in terms of delivering sustainable transport; and*
- *the identification of and response to environmental, ecological and landscape constraints on and around the site and how the proposal demonstrates that it would achieve a high quality of design, layout, ecological protection and enhancement, and landscaping to address the objectives of Policies DP26: Character and Design, DP37: Trees, Woodlands and Hedgerows, and DP38: Biodiversity.*

Effective use of employment land and premises will be made by:

- *Protecting allocated and existing employment land and premises (including tourism) unless it can be demonstrated that there is no reasonable prospect of its use or continued use for employment or it can be demonstrated that the loss of employment provision is outweighed by the benefits or relative need for the proposed alternative use;*
- *Permitting appropriate intensification, conversion, redevelopment and/ or extension for employment uses providing it is in accordance with other policies in the Plan;*
- *Giving priority to the re-use or adaptation of rural buildings for business or tourism use and to the diversification of activities on existing farm units (in accordance with Development in the Countryside policies).*

Neighbourhood Plans should:

- *Identify the needs of local businesses and their local residents for employment opportunities and any areas requiring economic regeneration, infrastructure provision or environmental enhancement as required by paragraph 21 of the National Planning Policy Framework; and*
- *Allocate sufficient land within their towns and villages to meet these needs.*

If monitoring indicates that there is an insufficient supply of allocated employment sites to meet the District's jobs needs, then the Council will consider allocating sites through a Site Allocations Development Plan Document, produced by the District Council.

- Policy DP21: Transport

Strategic Objectives: 6) To ensure that development is accompanied by the necessary infrastructure in the right place at the right time that supports development and sustainable communities. This includes the provision of efficient and sustainable transport networks; and 15) To create places that encourage a healthy and enjoyable lifestyle by the provision of first class cultural and sporting facilities, informal leisure space and the opportunity to walk, cycle or ride to common destinations.

Evidence Base: Mid Sussex Transport Study; West Sussex Transport Plan 2011-2026.

Development will be required to support the objectives of the West Sussex Transport Plan 2011-2026, which are:

- *A high quality transport network that promotes a competitive and prosperous economy;*
- *A resilient transport network that complements the built and natural environment whilst reducing carbon emissions over time;*
- *Access to services, employment and housing; and*
- *A transport network that feels, and is, safer and healthier to use.*

To meet these objectives, decisions on development proposals will take account of whether:

- *The scheme is sustainably located to minimise the need for travel noting there might be circumstances where development needs to be located in the countryside, such as rural economic uses (see policy DP14: Sustainable Rural Development and the Rural Economy);*
- *Appropriate opportunities to facilitate and promote the increased use of alternative means of transport to the private car, such as the provision of, and access to, safe and convenient routes for walking, cycling and public transport, including suitable facilities for secure and safe cycle parking, have been fully explored and taken up;*
- *The scheme is designed to adoptable standards, or other standards as agreed by the Local Planning Authority, including road widths and size of garages;*
- *The scheme provides adequate car parking for the proposed development taking into account the accessibility of the development, the type, mix and use of the development and the availability and opportunities for public transport; and with the relevant Neighbourhood Plan where applicable;*
- *Development which generates significant amounts of movement is supported by a Transport Assessment/Statement and a Travel Plan that is effective and demonstrably deliverable including setting out how schemes will be funded;*
- *The scheme provides appropriate mitigation to support new development on the local and strategic road network, including the transport network outside of the district, secured where necessary through appropriate legal agreements;*
- *The scheme avoids severe additional traffic congestion, individually or cumulatively, taking account of any proposed mitigation;*
- *The scheme protects the safety of road users and pedestrians; and*
- *The scheme does not harm the special qualities of the South Downs National Park or the High Weald Area of Outstanding Natural Beauty through its transport impacts.*

Where practical and viable, developments should be located and designed to incorporate facilities for charging plug-in and other ultra-low emission vehicles.

Neighbourhood Plans can set local standards for car parking provision provided that it is based upon evidence that provides clear and compelling justification for doing so.

• Policy DP26: Character and Design

Strategic Objectives: 2) To promote well located and designed development that reflects the District's distinctive towns and villages, retains their separate identity and character and prevents coalescence; 4) To protect valued characteristics of the built environment for their historical and visual qualities; 12) To support sustainable communities which are safe, healthy and inclusive; and 14) To create environments that are accessible to all members of the community.

Evidence Base: CABE Good Practice Guidance.

All development and surrounding spaces, including alterations and extensions to existing buildings and replacement dwellings, will be well designed and reflect the distinctive character of the towns and villages while being sensitive to the countryside. All applicants will be required to demonstrate that development:

- *is of high quality design and layout and includes appropriate landscaping and greenspace;*

- *contributes positively to, and clearly defines, public and private realms and should normally be designed with active building frontages facing streets and public open spaces to animate and provide natural surveillance;*
- *creates a sense of place while addressing the character and scale of the surrounding buildings and landscape;*
- *protects open spaces, trees and gardens that contribute to the character of the area;*
- *protects valued townscapes and the separate identity and character of towns and villages;*
- *does not cause significant harm to the amenities of existing nearby residents and future occupants of new dwellings, including taking account of the impact on privacy, outlook, daylight and sunlight, and noise, air and light pollution (see Policy DP29);*
- *creates a pedestrian-friendly layout that is safe, well connected, legible and accessible;*
- *incorporates well integrated parking that does not dominate the street environment, particularly where high density housing is proposed;*
- *positively addresses sustainability considerations in the layout and the building design;*
- *take the opportunity to encourage community interaction by creating layouts with a strong neighbourhood focus/centre; larger (300+ unit) schemes will also normally be expected to incorporate a mixed use element;*
- *optimises the potential of the site to accommodate development.*

• Policy DP28: Accessibility

Strategic Objectives: 12) To support sustainable communities which are safe, healthy and inclusive; 13) To provide the amount and type of housing that meets the needs of all sectors of the community; and 14) To create environments that are accessible to all members of the community.

Evidence Base: CABE Good Practice Guidance; Mid Sussex Whole Plan and CIL Viability Assessment (2016); DCLG Technical Housing Standards – nationally described space standard, March 2015; Housing and Economic Development Needs Assessment.

All development will be required to meet and maintain high standards of accessibility so that all users can use them safely and easily.

This will apply to all development, including changes of use, refurbishments and extensions, open spaces, the public realm and transport infrastructure, and will be demonstrated by the applicant.

With regard to listed buildings, meeting standards of accessibility should ensure that the impact on the integrity of the building is minimised.

Accessible and Adaptable Dwellings

Developments of 5 or more dwellings will be expected to make provision for 20% of dwellings to meet Category 2 – accessible and adaptable dwellings under Building Regulations – Approved Document M Requirement M4(2), with the following exceptions:

Where new dwellings are created by a change of use;

Where the scheme is for flatted residential buildings of fewer than 10 dwellings;

Where specific factors such as site topography make such standards unachievable by practicable and/or viable means;

Where a scheme is being proposed which is specifically intended for the needs of particular individuals or groups, where a greater proportion may be appropriate.

Wheelchair-user dwellings

Category 3 – Wheelchair-user dwellings under Building Regulations – Approved Document M Requirement M4(3) will be required for a reasonable proportion of affordable homes, generally 4%, dependent on the suitability of the site and the need at the time.

The Requirement will also apply to private extra care, assisted living or other such schemes designed for frailer older people or others with disabilities and those in need of care or support services.

- Policy DP29: Noise, Air and Light Pollution

Strategic Objectives: 3) To protect valued landscapes for their visual, historical and biodiversity qualities; and 12) To support sustainable communities which are safe, healthy and inclusive.

Evidence Base: Data held by Environmental Health, Air Quality Action Plan – Stonepound Crossroads, Hassocks.

The environment, including nationally designated environmental sites, nationally protected landscapes, areas of nature conservation or geological interest, wildlife habitats, and the quality of people's life will be protected from unacceptable levels of noise, light and air pollution by only permitting development where:

Noise pollution:

- *It is designed, located and controlled to minimise the impact of noise on health and quality of life, neighbouring properties and the surrounding area;*
- *If it is likely to generate significant levels of noise it incorporates appropriate noise attenuation measures;*

Noise sensitive development, such as residential, will not be permitted in close proximity to existing or proposed development generating high levels of noise unless adequate sound insulation measures, as supported by a noise assessment are incorporated within the development.

- *In appropriate circumstances, the applicant will be required to provide:*
- *an assessment of the impact of noise generated by a proposed development; or*
- *an assessment of the effect of noise by an existing noise source upon a proposed development;*

Light pollution:

- *The impact on local amenity, intrinsically dark landscapes and nature conservation areas of artificial lighting proposals (including floodlighting) is minimised, in terms of intensity and number of fittings;*
- *The applicant can demonstrate good design including fittings to restrict emissions from proposed lighting schemes;*

Air Pollution:

- *It does not cause unacceptable levels of air pollution;*
- *Development on land adjacent to an existing use which generates air pollution or odour would not cause any adverse effects on the proposed development or can be mitigated to reduce exposure to poor air quality to recognised and acceptable levels;*
- *Development proposals (where appropriate) are consistent with Air Quality Management Plans.*

The degree of the impact of noise and light pollution from new development or change of use is likely to be greater in rural locations, especially where it is in or close to specially designated areas and sites.

- Policy DP38: Biodiversity

Strategic Objectives: 3) To protect valued landscapes for their visual, historical and biodiversity qualities; and 5) To create and maintain easily accessible green infrastructure, green corridors and spaces around and within the towns and villages to act as wildlife corridors, sustainable transport links and leisure and recreational routes.

Evidence Base: Biodiversity 2020; Biodiversity Action Plan; Biodiversity Opportunity Areas; Green Infrastructure mapping; Habitats and Species Records; Mid Sussex Ancient Woodland Survey; Mid

Sussex Infrastructure Delivery Plan; The Natural Choice: Securing the Value of Nature; West Sussex SNCI Register.

Biodiversity will be protected and enhanced by ensuring development:

- *Contributes and takes opportunities to improve, enhance, manage and restore biodiversity and green infrastructure, so that there is a net gain in biodiversity, including through creating new designated sites and locally relevant habitats, and incorporating biodiversity features within developments; and*

- *Protects existing biodiversity, so that there is no net loss of biodiversity. Appropriate measures should be taken to avoid and reduce disturbance to sensitive habitats and species. Unavoidable damage to biodiversity must be offset through ecological enhancements and mitigation measures (or compensation measures in exceptional circumstances); and*
- *Minimises habitat and species fragmentation and maximises opportunities to enhance and restore ecological corridors to connect natural habitats and increase coherence and resilience; and*
- *Promotes the restoration, management and expansion of priority habitats in the District; and*
- *Avoids damage to, protects and enhances the special characteristics of internationally designated Special Protection Areas, Special Areas of Conservation; nationally designated Sites of Special Scientific Interest, Areas of Outstanding Natural Beauty; and locally designated Sites of Nature Conservation Importance, Local Nature Reserves and Ancient Woodland or to other areas identified as being of nature conservation or geological interest, including wildlife corridors, aged or veteran trees, Biodiversity Opportunity Areas, and Nature Improvement Areas.*

Designated sites will be given protection and appropriate weight according to their importance and the contribution they make to wider ecological networks.

Valued soils will be protected and enhanced, including the best and most versatile agricultural land, and development should not contribute to unacceptable levels of soil pollution.

Geodiversity will be protected by ensuring development prevents harm to geological conservation interests, and where possible, enhances such interests. Geological conservation interests include Regionally Important Geological and Geomorphological Sites.

- Policy DP39: Sustainable Design and Construction

Strategic Objectives: 1) To promote development that makes the best use of resources and increases the sustainability of communities within Mid Sussex, and its ability to adapt to climate change.

Evidence Base: Gatwick Sub Region Water Cycle Study; West Sussex Sustainable Energy Study, Mid Sussex Sustainable Energy Study.

All development proposals must seek to improve the sustainability of development and should where appropriate and feasible according to the type and size of development and location, incorporate the following measures:

- *Minimise energy use through the design and layout of the scheme including through the use of natural lighting and ventilation;*
- *Explore opportunities for efficient energy supply through the use of communal heating networks where viable and feasible;*
- *Use renewable sources of energy;*
- *Maximise efficient use of resources, including minimising waste and maximising recycling/re-use of materials through both construction and occupation;*

- *Limit water use to 110 litres/person/day in accordance with Policy DP42: Water Infrastructure and the Water Environment;*
- *Demonstrate how the risks associated with future climate change have been planned for as part of the layout of the scheme and design of its buildings to ensure its longer term resilience.*

- **Policy DP40: Renewable Energy Schemes**

Strategic Objectives: 1) To promote development that makes the best use of resources and increases the sustainability of communities within Mid Sussex, and its ability to adapt to climate change.

Evidence Base: Gatwick Sub Region Water Cycle Study; Capacity of Mid Sussex District to Accommodate Development Study; Mid Sussex Landscape Capacity Study; Mid Sussex Sustainable Energy Study; West Sussex Sustainable Energy Study.

Proposals for new renewable and low-carbon energy projects (other than wind energy development – see below), including community-led schemes, will be permitted provided that any adverse local impacts can be made acceptable, with particular regard to:

- *Landscape and visual impacts, including cumulative impacts, such as on the setting of the South Downs National Park and High Weald Area of Outstanding Natural Beauty, and the appearance of existing buildings;*
- *Ecology and biodiversity, including protected species, and designated and non-designated wildlife sites;*
- *Residential amenity including visual intrusion, air, dust, noise, odour, traffic generation, recreation and access.*

Assessment of impacts will need to be based on the best available evidence, including landscape capacity studies.

Proposals for wind energy development involving one or more wind turbines will only be granted if:

- *the development site is in an area identified as suitable for wind energy development in a Neighbourhood Plan; and*
- *following consultation, it can be demonstrated that the planning impacts identified by affected local communities have been fully addressed and therefore the proposal has their backing.*

- **Policy DP41: Flood Risk and Drainage**

Strategic Objectives: 1) To promote development that makes the best use of resources and increases the sustainability of communities within Mid Sussex, and its ability to adapt to climate change; and 12) To support sustainable communities which are safe, healthy and inclusive.

Evidence Base: Gatwick Sub Region Water Cycle Study; Strategic Flood Risk Assessment; Water. People. Places SuDS guidance.

Proposals for development will need to follow a sequential risk-based approach, ensure development is safe across its lifetime and not increase the risk of flooding elsewhere. The District

Council's Strategic Flood Risk Assessment (SFRA) should be used to identify areas at present and future flood risk from a range of sources including fluvial (rivers and streams), surface water (pluvial), groundwater, infrastructure and reservoirs.

Particular attention will be paid to those areas of the District that have experienced flooding in the past and proposals for development should seek to reduce the risk of flooding by achieving a reduction from existing run-off rates.

Sustainable Drainage Systems (SuDS) should be implemented in all new developments of 10 dwellings or more, or equivalent non-residential or mixed development

unless demonstrated to be inappropriate, to avoid any increase in flood risk and protect surface and ground water quality. Arrangements for the long term maintenance and management of SuDS should also be identified.

For the redevelopment of brownfield sites, any surface water draining to the foul sewer must be disconnected and managed through SuDS following the remediation of any previously contaminated land.

SuDS should be sensitively designed and located to promote improved biodiversity, an enhanced landscape and good quality spaces that improve public amenities in the area, where possible.

The preferred hierarchy of managing surface water drainage from any development is:

- Infiltration Measures*
- Attenuation and discharge to watercourses; and if these cannot be met,*
- Discharge to surface water only sewers.*

Land that is considered to be required for current and future flood management will be safeguarded from development and proposals will have regard to relevant flood risk plans and strategies.

• **Policy DP42: Water Infrastructure and the Water Environment**

Strategic Objectives: 1) To promote development that makes the best use of resources and increases the sustainability of communities within Mid Sussex, and its ability to adapt to climate change; 6) To ensure that development is accompanied by the necessary infrastructure in the right place at the right time that supports development and sustainable communities. This includes the provision of efficient and sustainable transport networks.

Evidence Base: Building Regulations (Approved Document G); Gatwick Sub Region Water Cycle Study; DCLG Housing Standards Review: Technical Consultation, September 2014; South East Water – Water Resources Management Plan 2014, Strategic Flood Risk Assessment.

New development proposals must be in accordance with the objectives of the Water Framework Directive, and accord with the findings of the Gatwick Sub Region Water Cycle Study with respect to water quality, water supply and wastewater treatment and consequently the optional requirement under Building Regulations – Part G applies to all new residential development in the district.

Development must meet the following water consumption standards:

- *Residential units should meet a water consumption standard of 110 litres per person per day (including external water use);*
- *Non-residential buildings should meet the equivalent of a 'Good' standard, as a minimum, with regard to the BREEAM water consumption targets for the development type.*

Development proposals which increase the demand for off-site service infrastructure will be permitted where the applicant can demonstrate;

- *that sufficient capacity already exists off-site for foul and surface water provision. Where capacity off-site is not available, plans must set out how appropriate infrastructure improvements approved by the statutory undertaker will be completed ahead of the development's occupation; and*
- *that there is adequate water supply to serve the development.*

Planning conditions will be used to secure necessary infrastructure provision.

Development should connect to a public sewage treatment works. If this is not feasible, proposals should be supported by sufficient information to understand the potential implications for the water environment.

The development or expansion of water supply or sewerage/sewage treatment facilities will normally be permitted, either where needed to serve existing or proposed new development, or in the interests of long-term water supply and waste water management, provided that the need for such facilities outweighs any adverse land use or environmental impacts and that any such adverse impact is minimised.

Mid Sussex Design Guide Supplementary Planning Document SPD 2020

- 2.14 This document provides clear design principles that aim to deliver high quality new development across Mid Sussex by prioritising sustainability in the design process. These principles are based on the policy framework provided by District Plan Policy DP26.
- 2.15 All new developments should be designed to high environmental standards by incorporating sustainable design and construction principles, including maximising energy and water efficiency, minimising carbon emissions and use of resources, reducing transport related emissions by using the existing transport network and providing facilities to promote sustainable transport options.
- 2.16 Principle DG37: Sustainable Buildings. It provides guidance to adopt a design principle to minimise environmental impacts by minimising the use of resources and energy.

Building Regulations Approved Document Part L

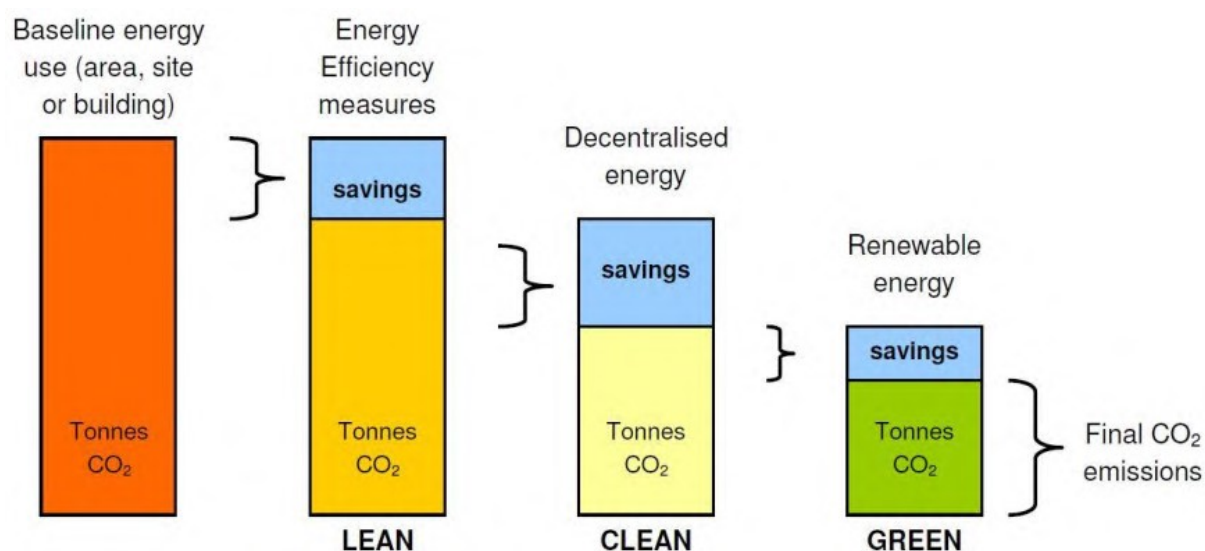
- 2.17 Part L of the current Building Regulations (2021) focuses on reducing carbon emissions in new and existing buildings. As the proposal involves an outline planning application that includes the construction of new residential dwellings, the development falls under the scope of Part L1A: 2021, which applies to new dwellings.

- 2.18 The overall structure of compliance with the 2021 Building Regulations for new buildings includes five criteria to comply with:
- **Criterion 1** – The Dwelling/Building Emission Rate (DER/BER) should be better than the Target Emission Rate (TER) and Dwelling/Building Primary Energy Rate should not exceed the Target Primary Energy Rate.
 - **Criterion 2** – Limit on design flexibility;
 - **Criterion 3** – Limiting effects of heat gain in summer;
 - **Criterion 4** – Commissioning and airtightness;
 - **Criterion 5** – Efficient operation of buildings.
- 2.19 The detailed energy strategy for the scheme will be developed to ensure the scheme meets the relevant requirements of the Building Regulations.

3.0 ENERGY EFFICIENCY STRATEGY – ‘BE LEAN’

Introduction

- 3.1 The proposed energy strategy has, as its first priority, minimised energy consumption through the performance of the building envelope and services. The following section details the energy efficiency features of the development.



- 3.2 This analysis includes:
- Building Regulations Approved Document L1 and L2 (2021) initial compliance assessment, identifying the potential for the design to comply with and exceed Building Regulations requirements and meet and exceed the Local Plan requirements.
 - An energy demand assessment of the proposed scheme contained within this document provides carbon dioxide emissions estimates from the analysis of passive energy efficiency enhancements and Low and Zero Carbon potential. This will use SAP 10 carbon dioxide fuel factors.
- 3.3 In further detail, the energy efficiency strategy of the scheme has been achieved by incorporating the following design and technology features:

Energy Efficiency Features

- 3.4 The proposed development at Land West of Gatesmead will adopt an ambitious fabric-first approach to significantly reduce primary energy demand. This approach will be supported by the integration of on-site low-carbon technologies to meet anticipated construction standards, which are expected to target zero-carbon performance. The following section outlines the energy strategy for both the new-build residential and non-residential components of the scheme.
- 3.5 All new-build residential dwellings will be required to comply with the minimum standards set out in Approved Document Part L1A.

Physical Form and Orientation of the Building

- 3.6 Proposed development comprises the construction of 49 new homes, together with open space and associated infrastructure. The layout has been carefully designed to optimise building orientation, achieving a balanced approach to thermal performance and access to natural daylight, both within the homes and across external amenity areas.
- 3.7 Good levels of natural daylight will be achieved for the majority of the scheme. This will reduce reliance on artificial lighting and thus limit energy consumption.

Overheating

- 3.8 A detailed Thermal Comfort Assessment has been undertaken by Create Consulting Engineer Ltd in accordance with CIBSE TM59 and Approved Document Part O guidance. The weather files were selected in line with CIBSE TM49 recommendations.
- 3.9 The assessment was conducted using the IES-VE dynamic thermal modelling tool, with the analysis carried out following CIBSE AM11: Building Energy and Environmental Modelling.
- 3.10 To mitigate the risk of overheating and maintain thermal comfort, several passive design strategies have been integrated into the scheme, including:
- A highly insulated and airtight thermal envelope,
 - Solar control glazing,
 - Window recess,
 - External shading, and
 - Operable windows to enable natural ventilation.
- 3.11 Due to noise constraints, dwellings located on the western side are expected to keep windows open during the daytime and closed overnight, thereby limiting the effectiveness of passive purge ventilation. In contrast, dwellings located away from the western boundary can utilise open windows during both day and night. Therefore, all dwellings will be provided with Mechanical Ventilation with Heat Recovery (MVHR) systems incorporating a summer bypass mode. When internal temperatures exceed 26°C and external temperatures are lower, the system facilitates free cooling by extracting warm indoor air and supplying cooler external air.
- 3.12 The results of the dynamic thermal modelling confirm that all habitable spaces within the dwellings comply with Part O thermal comfort criteria under the DSY1 (Design Summer Year 1) weather scenario. Additional simulations using DSY2 and DSY3 extreme weather files were undertaken for reference; while this also demonstrated compliance, assessment against these files is not mandatory under current guidance.
- 3.13 Furthermore, green infrastructure has been incorporated within the site design to enhance the microclimate, reduce surface water runoff, and mitigate local heat gain. These combined measures will help address the impacts of climate change and substantially reduce the risk of overheating across the development.
- 3.14 For detailed analysis and modelling outcomes, please refer to the Overheating Report (Ref: MB/VL/P25-3535/01).

Heat Island Effect

3.15 Urban Heat Islands are created due to the thermal gradient difference between developed and undeveloped areas. These are created due to site hardscape, including roads, sidewalks, courtyards, roofs, and parking lots. Reduction in the heat island effect can be achieved through both roof and non-roof measures. Increasing shades around the building can reduce the heat island effect created by hard surfaces. The following strategies can be incorporated.

- Planting trees—Planting trees and other vegetation lowers surface and air temperatures by providing shade and cooling through evapotranspiration. Trees and vegetation that directly shade dwellings can decrease the need for air conditioning, making your occupied space more comfortable and reducing the energy bill. Trees also protect occupant health by improving air quality, providing cooling shade for outdoor activities, and reducing exposure to harmful UV radiation.
- Green roof – This involved covering the roof with landscaping. Green roofs can absorb heat and act as insulators for him, reducing the need for cooling, improving indoor air comfort, and lowering heat stress associated with heat waves.
- Cool roof – Cool or reflective roof helps to reflect sunlight and heat away from the building, reducing the roof temperature. Cool roofs can provide annual energy savings and result in better air quality.
- Plant trees that provide shade over paved areas. These trees will help regulate the microclimate and can be considered a mitigation strategy for climate change, especially for dealing with heat waves during summer.
- Solar panels – Shading the building roof with solar panels

Proposed Building Fabric and Energy Efficiency Measures

3.16 Extensive coordination between the design teams has been undertaken to optimise energy efficiency. Measures incorporated at the BeLean stage include:

- High-performance, well-insulated building fabric exceeding Part L limiting values
- Double glazing to all windows and glazed doors
- High air tightness of $3 \text{ m}^3/(\text{h}\cdot\text{m}^2)$ @ 50 Pa.
- Mechanical ventilation with high-efficiency heat recovery where required
- Energy-efficient lighting, including LED luminaires with occupancy and daylight controls

3.17 The proposed fabric and M&E system performance targets at the BeLean stage are summarised in the tables below:

Element	Part L Limiting Value	Proposed	Improvement over Part L limiting value
External Wall U-value ($\text{W}/\text{m}^2\text{K}$)	0.26	0.16	38%
Roof U-value ($\text{W}/\text{m}^2\text{K}$)	0.16	0.10	38%
Ground Floor U-value ($\text{W}/\text{m}^2\text{K}$)	0.18	0.10	44%

Element	Part L Limiting Value	Proposed	Improvement over Part L limiting value
Windows, Glazed Doors, & Pedestrian doors U-value (W/m²K)	1.60	1.10 (double glazing)	31%
Glazing G-value	–	0.40	–
Air Permeability (m³/h·m² @50Pa)	8	3	62.5%

Table 3.1: Building Fabric Performance: Part L vs Proposed

Element	Proposed Be Lean Performance
HVAC Strategy	• Space heating will be provided by individual ASHPs via radiators or under-floor heating. • Domestic hot water will be supplied by the same ASHPs, integrated with a hot water cylinder. • All dwellings will be equipped with individual MVHR units.
HVAC Low-Carbon Efficiency	Notional specification heating system selected at the Be Lean stage in accordance with Part L 1A requirements.
Mechanical Ventilation	Vent-Axia Sentinel Kinetic B MVHR system with SFP 0.55 W/l/s and heat recovery efficiency of 85%.
DHW (Domestic Hot Water)	ASHP-integrated hot water systems with 150–200 L storage cylinders; default storage losses applied.
Lighting Luminaire Efficacy	100% Efficient Lighting

Table 3.2: Building Services and Systems Performance (BeLean Stage)

Commissioning and Handover

- 3.18 Design reviews shall be undertaken, and a commissioning plan shall be developed for the commissioning, performance testing and handover and post-handover stages. The schedule of the commissioning and testing shall detail a suitable timescale for the commissioning and re-commissioning of all complex and non-complex building services and control systems and the testing and inspection of building fabrics.
- 3.19 The schedule shall identify the appropriate standards for all commissioning activities to be conducted, where applicable, by:
- Current Building Regulations.
 - BSRIA guidelines.
 - CIBSE guidelines.
 - Other appropriate standards.

Standard Assessment Procedure (SAP) for dwellings

- 3.20 The Standard Assessment Procedure (SAP 10) forms the basis for demonstrating compliance with Part L1 of the Building Regulations 2021 and as such it has been used to estimate the energy efficiency features required for Part L compliance, as well as predict the annual building regulated energy demand, consumption, and CO₂ emissions of the dwellings.
- 3.21 The SAP methodology determines a Dwelling Emission Rate or 'DER.' This value is compared to the energy requirements and emissions of a notional dwelling of the same shape and dimensions which determines a compliant building (the Target Emissions Rate or 'TER').
- 3.22 The DER calculation determines the regulated energy use and emissions, which are described as the energy used for space and water heating as well as lighting, pumps, and fans. Unregulated energy is the energy used for cooking and appliances and is not included in Approved Document Part L. For the purpose of this study, the unregulated energy, as defined above, has been excluded from the calculations.
- 3.23 To meet the required standards of current building regulation Part L 2021, adherence to three key factors is needed: Dwelling Emission Rating, Dwelling Primary Energy Ratings, and Dwelling Fabric Energy Efficiency.
- 3.24 All typical dwellings, based on the accommodation schedule presented in the table below, have been modelled using the Standard Assessment Procedure (SAP) to establish the energy efficiency strategy for the development and to inform the base case energy demand of the development.

Unit Type	Unit Name	Configuration (Beds/Persons)	Number of Units
Maisonette	Aire	1B2P	4
	Avon	1B2P	
Maisonette	Itchen	2B4P	2
	Ouse	2B4P	
Semi-Detached House	Severn	2B4P	5
Semi-Detached House	Beaconsfield	3B5P	8
	Stour	3B5P	
Detached House	Harrogate	3B6P	7
	Lavenham	3B6P	
Detached House	Midhurst	4B8P	11
	Stowmarket	4B8P	
Semi-Detached House	Trent	4B6P	0
Detached House	Whitchurch	5B9P	8
	Woodbridge	5B9P	
Detached House	Woodstock	5B10P	4
Total			49

Table 3.3: Residential Unit Mix

- 3.25 The energy consumption and CO₂ emissions of the unregulated elements (cooking and appliances) have been estimated based on the methodology developed in Appendix L of SAP 2010 and adjusted for the revised carbon factors.

Spaces Modelled

- 3.26 A sample of typical residential dwellings has been modelled using SAP 10. All modelling has been carried out based on the latest architectural drawings issued by Crest Nicholson Operations Limited, dated March 2026.

Results of the Energy Simulation

- 3.27 The total regulated CO₂ emissions for the proposed development are estimated to be approximately 64.4 tonnes per year. This figure is derived from the energy modelling results, with a summary presented in Table 3.4. Detailed calculations are provided in Appendix A (Carbon Calculation Sheet) and Appendix B (Be Lean SAP Worksheet).

	Carbon Dioxide Emissions for residential buildings (Tonnes CO ₂ per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	64.2	-
After energy demand reduction (be lean)	49.4	-
Improvement over Part L1A: 2021	14.8	tCO ₂ per annum
	23%	

Table 3.4: Estimated CO₂ emissions from the Baseline and Be Lean case for proposed development

- 3.28 Overall, the proposed scheme achieves a 23% reduction in regulated CO₂ emissions compared to the Part L 2021 Baseline, demonstrating the effectiveness of the implemented energy efficiency measures.
- 3.29 To comply with Policy DP39 of the local plan, which requires minimising energy consumption and promoting the use of renewable energy, the proposed development will incorporate low-carbon and renewable energy technologies. A study of feasible systems for the development at Land West of Gatesmead is summarised in Section 4 of this report.

4.0 'BE CLEAN' – SUPPLY ENERGY EFFICIENTLY

- 4.1 Connection to a decentralised energy network and the use of combined heat and power are recognised methods of generating energy more efficiently. Policy DP39 of the Mid Sussex Local Plan encourages all new developments to reduce CO₂ emissions by using renewable energy and local energy systems where suitable. Development proposals should explore opportunities to link to an existing or planned decentralised energy network. Where an existing decentralised energy network is not present, major developments should undertake a detailed investigation into the feasibility of establishing a District Heating Network with the proposed development as an anchor heat load or contribute towards such feasibility work.

Decentralised Energy Networks

- 4.2 According to the Heat Network Planning Database (HNPd), there are no existing or potential heat networks in close proximity to the development site. The nearest proposed communal heat network identified in the HNPd is located at Central House, 25–27 Perrymount Road, Haywards Heath, approximately 1,125 meters from the development, as shown in the figure below. Connection to this network is considered not viable due to the significant distance and the constraints posed by the surrounding building footprint, making such a connection technically not feasible.



Figure 4.1: Distance from proposed development to nearest heat network

4.3 In situations where there are no existing connections for a decentralised heat network, and there are no immediate plans to incorporate decentralised energy sources into the development area, it's essential to explore various options and factors. These include the establishment of key infrastructure components like:

- Energy Centre
- Plant equipment and associated pipework within this centre
- Primary heating network
- Substations
- Provision for a temporary boiler space
- Secondary heating network
- Metering systems
- Heat interface units (HIUs).

5.0 LOW AND ZERO CARBON TECHNOLOGIES – ‘BE GREEN’

Overview

- 5.1 The final step in the energy hierarchy requires that the clean generation of energy by renewable energy technologies be examined.
- 5.2 The following section is a discussion of the various low and zero-carbon technologies that are currently available, with an appraisal of each one as to the potential suitability for installation within the development. As the scheme develops, and new technologies emerge, or existing technologies become more or less viable, all will continue to be assessed on an ongoing basis.

Low and Zero Carbon Technology	Suitability for the proposed development
Heat Pumps	YES
Photovoltaic Panels	YES
Solar thermal panels	NO
Biomass boilers	NO
Gas CHP	NO
Wind turbines	NO

Table 5.1: Review of suitability of LZC technology for the site

Proposed Low and Zero Carbon Technology – Air Source Heat Pumps (ASHP)

- 5.3 ASHPs are considered the most suitable options for providing low-carbon heating to the development. The choice of heat pumps was dictated by a number of restrictions and constraints posed by the development, such as:
- Limited roof area: The available roof space restricts the installation of a sufficient number of photovoltaic (PV) panels to offset carbon dioxide emissions. Additionally, the potential for CO₂ reduction from PV is smaller under SAP 10.2 emission factors (0.136 kgCO₂/kWh) compared with SAP 2012 (0.519 kgCO₂/kWh), due to the lower carbon intensity of grid electricity.
 - Ground Source Heat Pump (GSHP) limitations: The development occupies a site fully covered by the building footprint. This makes horizontal ground loops unfeasible, while the installation of vertical boreholes beneath the building would be technically complex and economically unviable due to the required spacing and drilling constraints.
 - Urban location constraints: The site's urban context provides no suitable space for the installation of a wind turbine or the storage of biomass fuel, making these technologies impractical.
- 5.4 Given these constraints, the client has selected ASHPs as the preferred solution for providing low-carbon heating and reducing CO₂ emissions across the development.
- 5.5 Heat Pumps utilize low grade heat to provide highly efficient, low carbon heating. They are a thermodynamic device based on the vapour compression cycle. The four elements of the refrigeration circuit are: the evaporator, compressor, heat exchanger and condenser. The heat, which is extracted from the medium, goes through a number of processes and is distributed throughout individual dwellings through a standard wet central heating system. Heat pumps utilise electricity to

drive their pumps and compressor units. They are essentially a form of efficient electric heating. The efficiency of a heat pump is rated by its coefficient of performance (CoP).

5.6 The following characteristics of the system will give it an advantage over other renewable technologies:

- High efficiency heating;
- Low impact on air quality;
- Low levels of noise when suitable location is chosen;
- Lower emissions when calculated using SAP 10 fuel carbon factors;
- Use of fuel that is becoming 'green' due to the grid decarbonisation.

5.7 ASHPs, which extract heat from the ambient air, require adequate external space for the installation of outdoor units. For this development, the ASHP units serving the residential dwellings could be located within designated amenity areas, such as private rear gardens. The indicative locations of the ASHP units are illustrated in Figure 5.1. These positions are preliminary and will be subject to confirmation at a later stage of the design development.



Figure 5.1: Indicative locations of ASHP units within rear garden amenity areas *(subject to detailed design confirmation).*

Photovoltaic Panels –Supplementing Technology

5.8 Photovoltaic cells directly convert sunlight into electrical current using semiconductors. The output of a cell is directly proportional to the intensity of the light received by the active surface of the cell. The location and positioning of PV cells are therefore critical to achieving acceptable performance.

5.9 Photovoltaics are suitable for any developments, however the carbon reduction achieved by the system is quite low due to decarbonisation of the grid and revised carbon factors for electricity. One kWp of PV in a horizontal position generates approximately 760 kWh of electricity per year, which translates to 177 kg of CO₂ savings per year (using SAP 10 carbon factors).

5.10 The proposed development incorporates sufficient roof space to facilitate the installation of photovoltaic (PV) panels across all dwellings. The design team has confirmed that each dwelling will

be equipped with a minimum of 4 PV panels, with an estimated capacity of approximately 1.6–1.8 kWp per dwelling (based on panel outputs of 400–450 W each).

- 5.11 At this stage, the locations of the PV panels, as illustrated in the figure below, are indicative only and should be considered preliminary. Final panel positions will be subject to confirmation and coordination during the subsequent stages of design development.



Figure 5.2: Indicative photovoltaic (PV) panel layout across proposed dwellings (*locations shown are preliminary and subject to detailed design development*).

- 5.12 For a description of other renewable technologies considered for the development but concluded to be unfeasible, please refer to Appendix D.
- 5.13 Based on the findings of the early-stage feasibility study, the following LZC technologies have been selected for the proposed residential dwellings at Land West of Gatesmead.

Building	Use	LZC Technology	Specification
Residential	Space & Water Heating	ASHP	Logic Air ASHP 4-10 kW with 150-200 L hot water cylinder
	Renewable Electricity	PV system	1.6kWp, 4 panels × 400W each, 8 m² net area, 30° inclination

Table 5.2: Proposed LZC Technologies – Residential Dwellings

- 5.14 The ASHP specified at this stage is for energy modelling purposes only. A system with similar performance characteristics will be selected and confirmed during the later stages of design.

Results of the Energy Simulation

- 5.15 The total regulated CO₂ emissions for the proposed development, following the incorporation of the Be Green measures, are summarised in Table 5.3. Detailed calculations are provided in Appendix A (Carbon Calculation Sheet) and Appendix C (Be Green SAP Worksheets).

	Total regulated emissions (Tonnes CO ₂ /year)	CO ₂ savings (Tonnes CO ₂ /year)	Percentage savings (%)
Part L 2021 baseline	64.2		
Be lean	49.4	14.8	23%
Be clean	49.4	0.0	0%
Be green	13.9	35.6	55%
Total Savings	–	50.4	78%

Table 5.3: CO₂ Emissions Savings from Be Green Measures – New Build

Note: The above figures are from Appendix D- Carbon Calculation sheet

- 5.16 The proposed residential dwellings will be designed to aim for compliance with the Future Homes Standard and achieve the equivalent of Code for Sustainable Homes Level 4 by delivering significant carbon reductions over earlier building regulation benchmarks.

Standard	Target Reduction
Future Homes Standard	75–80% over Part L1A 2013
Code for Sustainable Homes Level 4	~25% over Part L1A 2010
Part L1A 2021	31% improvement over Part L1A 2013
Proposed Development Aspirational Target	78% over Part L1A 2021

Table 5.4: Comparison of Proposed Development Performance against Standards

Reporting Energy Use Intensity (EUI) and space heating demand

- 5.17 The calculated Energy Use Intensity (EUI) and space heating demand for the proposed development have been compared against standard benchmark values. The results of the assessment are summarised in Table 5.5.

Building Type	EUI (kWh/m ² /year)	Target EUI (kWh/m ² /year)	Space Heating Demand (kWh/m ² /year)	Target Space Heating Demand (kWh/m ² /year)
Residential	22.12	55	5.35	15

Table 5.5: Energy Use Intensity and Space Heating Demand for the Proposed Development.

- 5.18 Full calculation outputs for space heating and EUI can be found in Appendix A and Appendix E.

6.0 TRANSPORT

- 6.1 Sustainable transport links are central to sustainable development. They make a positive contribution to the environment and to the social and economic sustainability of the communities they serve. The provision of alternative sustainable transport options and associated facilities reduces dependency on fossil fuel-based transport options and provides the following benefits.
- Encourages active travel and helps improve occupants' health and wellbeing;
 - Reduce traffic congestion and encourage clean travel, which improves the local air quality; and
 - Provides cost savings compared with maintaining and running traditionally fuelled cars.
- 6.2 Ridge and Partners LPP were commissioned to carry out the transport assessment and travel plan in support of the planning application for the proposed development.
- 6.3 The site currently comprises circa 4.5ha of agricultural land. It is situated in proximity to a railway line running north-south along the western boundary of the site.
- 6.4 From the site, the town centre can be reached through the B2272 and B2112, both of which lead to the A272. This road bypasses the town to the south and west, continuing east toward Uckfield. To the west of the site, the A272 links with the A273 towards Burgess Hill and the A23, establishing a route between Brighton and London, and becoming the M23 between Crawley and the M25.
- 6.5 The site has good accessibility via sustainable modes, with local shops, schools, and health services within walking and cycling distance. Bus stops are an 8-minute walk away, and Haywards Heath railway station is about 900m from the site, offering regular services to Brighton and London. The residential highway network has 30mph speed limits and sidewalks, with no current safety issues reported. The site scores 65 on the DfT Connectivity Tool, ranking in band A, and is among the Top 60 highest productivity Travel to Work Areas.
- 6.6 The development proposes up to 49 residential dwellings with primary access for pedestrians and cyclists from Gatesmead, featuring traffic calming measures and safe crossing. It includes secondary connections to the surrounding Public Rights of Way network, enhancing permeability. Also, the proposed development will have vehicular access to Gatesmead, which links to Portsmouth Lane in the east via Birchen Lane.
- 6.7 The plan offers adequate car and cycle parking, electric vehicle charging, and off-site pedestrian improvements, such as dropped kerbs and enhanced walkways to bus stops and the railway station. Infrastructure upgrades aim to improve pedestrian safety and accessibility, aligned with WSCC guidance and national policy. Key enhancements will focus on routes connecting the site, bus stops, and Haywards Heath railway station, including continuous footway improvements.
- 6.8 Further improvements to the Public Rights of Way network consist of a quality crossing of Footpath and funding for resurfacing Footpath, enhancing connectivity between residential areas. Overall, these upgrades will benefit future residents and the wider community by promoting sustainable travel and improving safety.
- 6.9 A four-step travel demand methodology has been used to estimate the transport impacts of the development, such as Trip generation using the TRICS database, Trip distribution based on Census

data, Mode share from Census data, adjusted for a vision-led scenario and Vehicle trip assignment to the local highway network.

- 6.10 Both a Business-as-Usual scenario and a vision-led scenario have been assessed, with the latter showing reduced vehicle trips due to greater walking, cycling, and public transport use, highlighting the site's accessibility and proposed Travel Plan measures.
- 6.11 The highway impact assessment carried out indicates that the development will have a negligible impact on the operation or safety of the local highway network.
- 6.12 A vehicle swept path analysis shows that the access can accommodate a large refuse vehicle (11.22 meters) and an emergency vehicle (6.5-meter fire tender), typical for the Mid Sussex District. This analysis is included in the transport assessment, and the designs follow the Manual for Streets (MfS) and WSCC Design Guidance.
- 6.13 A Travel Plan has been prepared to accompany the development, setting out measures to promote walking, cycling and public transport in line with the Local plan.
- 6.14 The transport assessment undertaken for the proposed development indicates that the project will not cause a severe impact on the local road and transport infrastructure, and the scheme will promote sustainable travel practices.

7.0 CLIMATE CHANGE – MITIGATION AND ADAPTATION

- 7.1 Climate change brought about by man-made emissions of greenhouse gases has been identified as the greatest challenge facing human society at the beginning of the 21st century.
- 7.2 The effects of climate change are complex; they include:
- Increased average temperatures.
 - Rising sea levels.
 - Increased precipitation.
 - More frequent extreme weather.
- 7.3 Action to address climate change falls into two categories: mitigation and adaptation. Mitigation measures are designed to reduce greenhouse gas emissions to slow down or stop climate change, whilst adaptation measures are designed to adjust society and dwellings to cope with climate change.

Climate Change Adaptation and Mitigation Strategy

- 7.4 The energy strategy for the scheme has considered measures to mitigate the effects of climate change through the specification of energy-efficient systems. The Energy Strategy is discussed further in Sections 3 to 5 of this report.

Water Efficiency

- 7.5 Water conservation has been incorporated into the proposed development through the implementation of water efficiency measures, in accordance with the updated Part G building regulation (2024 Amendment) and Policy DP39: Sustainable Design and Construction
- 7.6 The development will aim for internal water use below 110 litres per person per day, surpassing the enhanced requirements of Part G Building Regulations.
- 7.7 To achieve a reduced indoor water use, a combination of the following water-efficient fittings is proposed for the dwellings:
- Dual flush WC's – cisterns with both a half flush and full flush. The half flush delivers 3 litres for the removal of liquids, whilst the full flush delivers 6 litres for a long flush.
 - Flow restrictors & aerators – restrictors fit within the existing plumbing structure of the shower head or connection pipe to taps to restrict water flow and reduce the outlet flow and pressure. Aerators restrict the flow of water but maintain pressure by adding air to the water, giving the perception of a powerful shower/taps without the water and energy consumption.
 - Low volume baths – are typically the same size as a standard bath, but shaped to match the contours of the body, creating a more efficient area to be filled, conserving water.
 - Appliances – where dishwashers and washing machines are specified, consideration will be given to low water-consuming appliances.

7.8 The following table presents a combination of water-efficient fittings which would allow the scheme to achieve an aspirational indoor water use lower than 110 litres/person/day and details the government's calculation methodology for assessing water consumption for the dwellings.

Installation Type	Unit of measure	Capacity/ flow rate (1)	Use Factor (2)	Fixed use (litres/ person/day) (3)	Litres/person/day = [(1) x (2)] + (3) =(4)
WC (dual flush)	Full flush volume (litres)	4.5	1.46	0	6.57
	Part flush volume (litres)	3	2.96	0	8.88
Taps (excluding kitchen/utility room taps)	Flow rate (litres/minute)	5	1.58	1.68	9.58
Bath (where shower also present)	Capacity to overflow (litres)	150	0.11	0	16.5
Shower	Flow rate (litres/minute)	8.5	4.37	0	37.14
Kitchen/utility room sink taps	Flow rate (litres/minute)	6	0.44	10.36	13.00
Washing machine	Litres/ kg dry load	8.17	2.1	0	17.15
Dishwasher	Litres/ place setting	1.25	3.6	0	4.5
-5	Total calculated use (litres/person/day) = (SUM column 4)				113.33
-6	Contribution from greywater (litres/person/day)				0
-7	Contribution from rainwater (litres/person/day)				0
-8	Normalisation factor				0.91
-9	Total water consumption (total used for Code for Sustainable Homes and SCDC policy) = [(5) - (6) - (7)] x (8) (litres/person/day)				103.13
-10	External Water Use				5
-11	"Total Water Consumption				108.13

Table 7.1: Water Efficiency Calculator Tool

7.9 Please note that the exact combination of fittings selected for each dwelling is not prescriptive and may vary from the selection included in Table 7.1. The purpose of the table is to demonstrate the level of performance that can be achieved with commercially available fittings that are technically and economically feasible.

- 7.10 A specification for water meters on the mains water supply will facilitate water consumption management and monitoring to reduce the impacts of water inefficiencies and leakage. The development may consider incorporating a mains water meter on the main supply to the new dwellings.
- 7.11 During the construction phase, best practices for water conservation will be implemented. This will involve the efficient use of water for site operations, including dust suppression and equipment cleaning, to minimise waste.
- 7.12 The contractor will be responsible for closely monitoring water consumption on site and shall establish clear reduction targets. Regular reviews of water usage will be conducted, and any opportunities to further reduce water consumption during construction will be implemented whenever feasible.
- 7.13 These strategies ensure that the project shall reduce consumption of potable water for sanitary use through water-efficient components and promote water conservation measures during construction and the post-occupancy period.

Urban Heat Island Effect

- 7.14 Urban Heat Islands are created due to the thermal gradient difference between developed and undeveloped areas. These are created due to the site's hardscape, including roads, sidewalks, courtyards, roofs, and parking lots. Reduction in the heat island effect can be achieved through both roof and non-roof measures. Increasing shades around the building can reduce the heat island effect created by hard surfaces. The following strategies could be incorporated.
- Planting trees—Planting trees and other vegetation lowers surface and air temperatures by providing shade and cooling through evapotranspiration. Trees and vegetation that directly provide shade to dwellings. This can decrease the need for air conditioning, making the home more comfortable and reducing the energy bill. Trees also protect occupant health by improving air quality, providing cooling shade for outdoor activities, and reducing exposure to harmful UV radiation.
 - Solar panels – Providing solar panels on the roof will act as a shade, thus reducing the heat absorption through the roof, preventing direct solar radiation. This will reduce the amount of heat absorbed by the roof and facilitate natural ventilation through the air gaps, reducing heat transfer into the building.
 - Thermal Mass – Incorporating high-density materials like concrete, brick, or stone will allow the building to absorb and store thermal energy during the day for gradual release at night. When integrated with effective insulation and passive ventilation, thermal mass stabilises internal temperatures, effectively mitigating summer overheating while retaining warmth throughout the winter.
 - Using high-albedo (light-coloured) paving and roofs is an effective strategy to mitigate the Urban Heat Island effect by reducing the amount of solar radiation absorbed by ground surfaces. Traditional dark asphalt and concrete can reach high surface temperatures during summer, storing and re-radiating heat into the surrounding environment. In contrast, lighter-coloured or reflective paving materials increase surface reflectivity, helping to keep streets, footpaths and public spaces cooler. This not only lowers local air and surface temperatures but also improves pedestrian comfort, reduces the risk of heat-related stress, and can contribute to reduced energy demand for cooling in nearby buildings.

Flood Risk Assessment (FRA) & Surface water drainage Strategy (SuDS)

- 7.15 A Flood Risk Assessment and Surface Water Drainage Strategy was undertaken by Ridge and Partners LLP for the proposed development.
- 7.16 The assessment shows that the site is located within Flood Zone 1. Various flooding sources were evaluated, including Tidal and fluvial flooding, surface water, artificial water bodies, groundwater, and sewer systems. The findings indicate that the site has a low residual flood risk from all the flooding sources.
- 7.17 The ground and the surrounding areas are made up of bedrock consisting of Upper Tunbridge Wells Sand (interbedded sandstone and siltstone), and based on geotechnical tests, drainage through infiltration is not a viable option.
- 7.18 In adherence to the Sustainable Drainage Systems (SuDS) hierarchy, the next step is to discharge surface water at the greenfield runoff rate into a natural watercourse located along the northern boundary of the site. A discharge consent will be required before constructing the drainage network.
- 7.19 The development has proposed various Sustainable Drainage Systems (SuDS) components, including swales, porous paving, and an attenuation pond, which are integrated into the strategy to provide water attenuation, improve water quality, and enhance biodiversity.
- 7.20 Surface water runoff from rooftops will be directed through rainwater downpipes into the surface water network within the site's roads. Runoff from roads and footpaths will be collected via road gullies, conveyed to swales, and then into the surface water network. This water will be attenuated in a pond northeast of the development and discharged at a controlled rate of $(Q_{Bar}) = 10.1 \text{ L/s}$ through a manhole into the adjacent watercourse. Porous paving in private driveways will further improve water quality and provide additional attenuation.
- 7.21 The system will be designed to handle a 1 in 100-year storm event with a 45% climate change allowance. While minimal flooding may occur in some areas of paving, excess water will drain into the swale, which has the capacity to manage this overflow.
- 7.22 The total on-site storage capacity for water management comprises 275.813 m^3 from porous paving, 78.855 m^3 from swales, and 868.967 m^3 from the attenuation pond, bringing the overall total to $1,223.635 \text{ m}^3$. Additionally, the Sustainable Drainage Systems (SuDS) features are designed to provide effective treatment of water prior to its discharge into the watercourse, ensuring environmental protection and compliance with regulations.
- 7.23 The development will feature an attenuation basin designed to manage surface water runoff. This basin will discharge water at a controlled rate, matching the existing greenfield Q_{med} for up to a 1 in 100-year event, accounting for climate change. The water will be directed into the existing ditch along the western boundary of the site.
- 7.24 The SuDS scheme will safely manage flood risk, reduce runoff volume, improve the water quality of the runoff exiting the site, and enhance biodiversity, ensuring a sustainable and climate-resilient drainage strategy for the site.

- 7.25 Management and Maintenance of the drainage assets could be carried out by the developer for the site, and the shared spaces will be maintained by a private management company as part of the wider Site management regime.
- 7.26 Overall, the risk of surface water flooding at the site due to the development is minimal. With the implementation of mitigation measures, the risks can be further reduced. The proposed development complies with NPPF, PPG, and local planning policy in relation to surface water management.

8.0 POLLUTION

Air Pollution

- 8.1 Aether Ltd was commissioned to carry out an air quality assessment in support of the planning application for the proposed development.
- 8.2 The air quality assessment (Ref: 3638/01) was conducted by establishing a baseline and by using air quality monitoring data to evaluate the air quality impact of the proposed development, particularly focusing on NO₂, PM₁₀ and PM_{2.5} concentrations across the site.
- 8.3 The Site is not located within or in close proximity to any Air Quality Management Area (AQMA). Previous air quality monitoring data indicated that the predicted annual mean NO₂, PM₁₀ and PM_{2.5} concentrations across the site are below the UK Air Quality objectives; therefore, future site users will not be exposed to high pollutant concentrations.
- 8.4 The proposed development is expected to generate only 307 additional vehicle movements per day (AADT), which is well below the 500 AADT screening threshold set by IAQM and EPUK. The increase in traffic is considered too small to have a significant impact on local air quality. As a result, the use of detailed dispersion modelling is not considered necessary, and a simpler assessment approach is sufficient to evaluate the development's effects.
- 8.5 Construction activities, including earthworks, building works, and associated vehicle movements, have been identified as the key environmental aspects of the development with the potential to negatively affect local air quality. The medium risk category identified is due to dust arising from earthworks, construction and low risk associated with track outs. The overall dust-related risk level for construction activities is considered as medium. However, with the implementation of appropriate risk-based mitigation measures, the impacts due to fugitive dust emission-related risks during the construction phase can be minimised.
- 8.6 It is recommended to develop and implement a Construction Environmental Management Plan (CEMP) during site preparation and the construction period. It is also recommended to carry out dust monitoring through the implementation of a Dust Management Plan during the construction phase.
- 8.7 In relation to the indoor air quality and occupant health, the building should establish good indoor air quality performance. Enhanced indoor air quality would help to improve occupant comfort and well-being and prevent or minimise exposure of building occupants, indoor surfaces and ventilation air distribution systems to environmental pollution and tobacco smoke. A mechanical ventilation system shall be made which complies with CIBSE standards. Provision of low-emitting materials and materials with low VOC content shall be used for:
- Adhesives and sealants
 - Paints and coatings
 - Polishes and finishes
 - Flooring system
 - Composite wood and Agri fibre products.

Noise

- 8.8 Noise.co.uk. Ltd has conducted a Noise Impact Assessment for the planning application of the proposed developments as referenced in 23230 -1-R1.
- 8.9 The Noise survey was conducted at the proposed site in accordance with BS 7445-1:2003 and BS7445-2:1991. The measured background noise levels are 56.3 dB during the day and 50.8 dB at night. To avoid adverse impacts from plant noise, it is recommended that the Rating noise level does not exceed these background levels at the nearest residential property.
- 8.10 To achieve the desired indoor noise levels, windows (glazing) should provide a minimum sound reduction of 25 dB Rw + Ctr should be achieved as set out in Table 8. Standard double glazing typically meets the window requirement, but any combination of glazing and vents is acceptable as long as the minimum performance is achieved. If more than one ventilator is installed in a room, each vent may need a higher individual rating to ensure the total reduction meets the target. A qualified professional should verify that the glazing and ventilation system complies with Approved Document F.
- 8.11 The proposed development has been assessed as acoustically viable, subject to the application of good design principles. Night-time noise levels are elevated and will inform the ventilation strategy. It is anticipated that systems such as Passive stack ("natural") and Continuous mechanical extract ventilation solutions will be required to ensure compliance with BS 8233 and WHO internal noise criteria, while still providing adequate ventilation without reliance on open windows.
- 8.12 External amenity areas shall be designed in accordance with the BS8223 guideline. It is recommended that gardens and patios be located behind the dwellings or provided with standard close-boarded fences. With these measures, external noise levels are expected to remain below the desirable 50 dB LAeq,T guideline, and within the upper acceptable limit of 55 dB LAeq,T in noisier conditions. It is recommended to provide 2.4m and 3 m fences in the garden and patio areas to achieve the desirable external noise level for amenity spaces.
- 8.13 Overall, the assessment demonstrates that, with the adoption of appropriate acoustic design principles and ventilation strategies, the proposed development is capable of delivering a high-quality acoustic environment for future residents. Noise is therefore not considered to present a constraint to the granting of planning permission, subject to appropriate conditions.
- 8.14 Construction-related noise impacts will be reduced through best practice measures such as installing acoustic barriers and screening, selecting construction equipment that produces less noise, using rubber matting or other vibration isolation tools under stationary vibrating equipment and scheduling high impact activities during the hours that cause the least disruption.

Land Pollution

- 8.15 Ridge and Parter LPP has conducted a preliminary risk assessment for land contamination for the planning application.
- 8.16 The desk study and site investigation survey have been conducted for the existing site and revealed a low risk of contamination.
- 8.17 The study confirms that there was no on-site Potential contamination sources identified. Off-site potential contamination sources include heavy metals, polycyclic aromatic hydrocarbons (PAHs),

PCBs, Ethylene glycol, Creosote, Herbicides, ash, and sulphates, as well as some potential for ground gas generation associated with ground workings involved in the development of the railway.

8.18 The assessment found that:

- Risks to future residents from exposure to impacted soils are low/negligible.
- Risks to water pipes, groundwater, and surface water are low.
- Risks to construction workers are very low and manageable with PPE.
- Risks from radon gas and UXO are low, requiring no mitigation.

8.19 Further ground investigation will be needed to cover areas not yet surveyed, especially where buildings are proposed. Existing topsoil and natural soils are generally suitable for reuse in gardens, while imported soils must meet contaminant standards. No made ground was found, and soils can be classified for appropriate disposal to reduce costs.

8.20 For foundations, low-rise buildings up to three storeys can use traditional foundations, with raft or piled foundations considered for weak soils or taller buildings. Groundwater was generally not encountered, but allowances should be made during construction. Buried concrete should meet DS-1/AC-1 standards, and suspended floor slabs are recommended due to shrinkable soils.

8.21 The site slopes northeast, and care is needed in earthworks to avoid retaining issues. Infiltration testing was poor, so engineered drainage is required. Additional geotechnical, groundwater, and laboratory testing will be needed once the final site layout is confirmed.

9.0 BIODIVERSITY AND LANDSCAPE

- 9.1 Ecosupport Ltd has conducted Ecological Impact Assessments for the proposed development.
- 9.2 A site survey was conducted to assess the existing ecological conditions. The Site comprises three grassland fields, separated by treelines or linear woodland with deciduous woodland habitat.
- 9.3 The site is bordered to the west by rail lines, with residential development to the south and east, and an adjacent grassland retained from a previous project. To the north lies ancient woodland, surrounding Haywards Heath golf course. The wider area consists mainly of residential dwellings and urban infrastructure in Haywards Heath to the south, while to the north, it features woodland, hedgerows, and arable pasture.
- 9.4 The site survey identified potential ecological habitats such as Bats, Reptiles, trees, Hazel Dormice, Breeding and nesting Birds, and Rush Pasture.
- 9.5 The Proposed development shall result in loss of ecological habitat. The site is deemed to have at least 'county' importance for commuting and foraging bats, with notable species present. Vegetation removal may reduce foraging resources, and the introduction of new lighting could disrupt their commuting routes. Some trees identified with potential roosting features will also need to be removed, posing a risk to bats if they are present. A low population of Slow Worms and Grass Snakes was found primarily along the western and northeastern boundaries, and the proposed works could harm their habitat, leading to potential injury or death without proper mitigation. While no badger setts were found, the area is suitable for foraging and commuting badgers, creating a risk of them being trapped in open excavations during construction.
- 9.6 Dormice have been confirmed on-site, and vegetation clearance could harm them by diminishing their foraging and nesting resources. The site also supports various breeding birds, including 11 species classified as Birds of Conservation Concern 5. Although much of the surrounding woodland will be retained, there is a risk of disturbing nesting birds and damaging their nests due to vegetation removal. Additionally, rush pasture, a priority habitat, is present in the north-eastern portion of the site, and the planned works could impact this habitat, leading to permanent loss without appropriate mitigation measures.
- 9.7 The proposed residential site is situated in close proximity to the Wickham Woods Local Wildlife Site (LWS), which is designated for its significant ancient woodland habitat and is located approximately 0.07 km north of the site boundary. Hence, A minimum buffer zone of 15m will be provided from the ancient woodland situated to the north of the proposed access route, with sensitive measures implemented to minimise damage to trees/ roots within this area as required.
- 9.8 The proposed development shall adopt mitigation measures to minimise the impact on the existing ecology by adopting measures such as the project plan, which focuses on preserving existing habitats to support local wildlife. Key measures include maintaining hedgerows and woodlands while implementing dark corridors and sensitive lighting for bats. Tree removal will follow a cautious approach, overseen by an ecologist. Reptiles will be managed through exclusion fencing and translocation efforts, while badger setts will be surveyed beforehand. For hazel dormice, vegetation clearance will adhere to EPS licensing, and compensatory planting will be provided. Additionally, breeding birds will benefit from habitat preservation and nest boxes, while rush pasture habitats will be retained and sensitively translocated as needed.

- 9.9 Best-practice measures will be implemented during construction to minimise impacts, potentially via a Construction Environmental Management Plan (CEMP). Mitigation includes Woodland areas, hedgerows, tree lines, and individual trees, which will be protected during the proposed works using Heras fencing to prevent machinery access. Mature trees will receive standard arboriculture protection to safeguard their canopy and roots. To avoid disturbing bats and other nocturnal wildlife, construction will be limited to daylight hours, stopping 30 minutes before dusk and resuming at dawn. Lighting will be designed to minimise wildlife impact by using low-level, downward-facing, sensor-activated lights whenever possible.
- 9.10 Biodiversity net gain will be achieved through habitat enhancements across the Site, targeting a minimum 10% net gain post-development. Measures include:
- The buffer zone will be planted with a variety of native shrubs to create a natural woodland edge environment. The planting density will aim for a minimum of 2-3 plants per square meter adjacent to the woodland, gradually becoming sparser as it moves east and south away from the woodland and hedgerow.
 - Dormouse nest boxes will be installed on suitable trees within the retained woodland habitat surrounding the site.
 - To improve the availability of roosting resources on site, bat boxes will be provided and installed on appropriate trees, as well as integrated into newly constructed dwellings.
 - New buildings will use one Swift brick in a 1:1 ratio, with bricks clustered in groups of 2 to 3. Six bird boxes will also be installed on mature trees for nesting opportunities.
 - Existing habitat where possible will be retained and new habitat will be created as per the BNG strategy. New habitat will include vegetated garden, introduced shrubs, diverse range of mixed scrub.
 - Overall, any proposed planting should strive for the same 70:30 ratio, favouring native species over non-native and ornamental types.
- 9.11 The Defra Statutory Biodiversity Metric system has been used in calculating the site's Biodiversity net gain. The proposed development shall result in the loss of ecological value. The DEFRA Statutory Biodiversity Metric reveals a net loss of 41.09% in area habitats (equivalent to 14.16 habitat units) and a net gain of 35.82% in hedgerow units (which translates to an increase of 0.56 hedgerow units). However, the trading rules have not been met. To achieve a 10% net gain, an additional 3.45 area habitat units are required. Consequently, the site has not met the 10% net gain requirement for biodiversity, and further actions are needed through off-site habitat enhancement. Nevertheless, the proposed development scheme has successfully achieved a substantial increase in hedgerow habitats.
- 9.12 To address the habitat deficit, biodiversity credits will be purchased. These can be obtained privately through conservation covenants or Section 106 agreements, and registered on the Biodiversity Gain Site Register, or from providers like the Environment Bank, which supplies the necessary credits to offset the development's impact.

10.0 CULTURAL HERITAGE

- 10.1 RPS conducted a Cultural Heritage Assessment, which confirmed the absence of designated archaeological assets—such as Scheduled Monuments, Registered Battlefields, or Historic Wrecks—within the site or its immediate vicinity.
- 10.2 The assessment identified no designated built heritage assets that would be directly affected by the proposed development. However, a low degree of impact is anticipated for the Grade II listed Wickham Farmhouse and Grade II listed Saunte House. To mitigate this, the southern portion of the site will be retained as landscaped open space. By preserving these views and maintaining the existing character of the area, the project minimizes potential harm. Overall, the scheme's public benefits significantly outweigh these minor impacts.

11.0 MATERIALS MANAGEMENT

Materials

- 11.1 It is recommended to use materials with a low environmental impact, as well as seek to use locally sourced, recycled and reclaimed materials where possible.
- 11.2 The origin of materials chosen in the design and construction, where possible, will be selected carefully to minimise the local and wider negative impact on the natural environment. Locally extracted, manufactured, and sold materials should be procured.
- 11.3 It is recommended for the applicant to commit to procure timber from sustainable sources through approved schemes such as the Forest Stewardship Council (FSC) and Programme for the Endorsement of Forest Certification (PEFC).
- 11.4 When designing new developments, careful consideration is given to the impact of material selection.
- 11.5 The energy and natural resources consumed during extraction, procurement, processing, and manufacturing processes can be substantial. Therefore, preference will be given to the selection of sustainable materials that adhere to the principles outlined in the Green Guide. These materials should demonstrate low environmental impact over their life cycle and be sourced through sustainable procurement practices. Additionally, responsible supply chain management and waste disposal strategies will be prioritised to enhance sustainability efforts further.
- 11.6 The principal contractor, operating on behalf of the Applicant, will be required to ensure that commitments and specifications within the Sustainable Procurement Plan are upheld and accounted for. Good-practice principles for the responsible sourcing of sustainable materials will be applied across the scheme.
- 11.7 The applicant shall ensure that the proposed development gives preference to the selection of sustainable materials and the minimisation of materials. The following measures will be considered to demonstrate that the materials specified are sourced, managed, and used sustainably:
- The use of locally sourced materials will be prioritised, where feasible, to reduce transport-related emissions and to support local supply chains;
 - Responsible sourcing of materials from suppliers that operate an Environmental Management System will be prioritised.
 - 100% of all timber included in the construction of floors, roofs, walls, and staircases will be legally sourced;
 - The use of materials with high recycled content will be considered.
 - The use of recyclable materials, such as aggregate, will be considered;
 - The use of insulation materials with low Global Warming Potential (GWP) will be prioritised;
 - The use of high VOC content paints, sealants and all ozone-depleting materials, including insulation, will be avoided where possible.
 - Specific consideration will be given to embodied energy and durability, and the strength of materials selected for the scheme.
- 11.8 The proposed developments will be designed in accordance with circular economy principles, supporting the low-energy transformation initiative to reduce embodied carbon, maximise material reuse, and minimise waste generation.

Build Less

- 11.9 The principle of Build Less in the circular economy prioritises reusing, retaining, or adapting existing assets to reduce the demand for new construction. This can include the repurposing of existing dwellings, infrastructure, or materials on-site, thereby avoiding unnecessary new build and preserving embodied carbon.
- 11.10 Build Less is not directly applicable due to the absence of existing dwellings or infrastructure on the site. The focus therefore shifts towards other Circular economy principles to ensure that the new development minimises material demand, reduces waste, and maximises long-term value.

Build Light

- 11.11 To reduce material intensity and overall building weight, lightweight construction solutions could be adopted. These include using lightweight internal partitions and finishes, limiting screed application, and standardising window sizes to optimise material efficiency. This approach reduces resource consumption, simplifies future adaptability, and supports easier disassembly at the end of life.

Build Wise

- 11.12 The design philosophy focuses on longevity and adaptability. Lightweight internal walls and efficient column layouts will allow flexible reconfiguration of internal spaces, accommodating future needs without extensive demolition. Exposed building elements are designed to resist degradation from environmental factors such as solar radiation, wind, and temperature variations, ensuring durability. Furthermore, it is recommended to prepare and issue a disassembly guide to the future occupants to facilitate material recovery and recycling when the dwellings reach the end of their lifecycle.

Build Low Carbon

- 11.13 Material selection will emphasise low embodied carbon and high recycled content. Priority will be given to locally sourced materials to reduce transport emissions and support regional economies. By reducing reliance on high-carbon products and increasing recycled input, the development aims to significantly lower its carbon footprint.

Build for the Future

- 11.14 New dwellings are being designed with adaptability in mind, allowing them to serve alternative purposes in the future. This forward-thinking approach reduces the likelihood of demolition and waste generation, promoting a long-term circular strategy.

Build Collaboratively

- 11.15 The circular economy approach will be implemented through a collaborative process involving architects, engineers, and sustainability experts. This integration ensures that circular principles apply to new developments, emphasising waste reduction and resource efficiency.

12.0 WASTE MANAGEMENT

Sustainable Construction

- 12.1 Sustainable construction practices include good site management to encourage resource efficiency, increase materials recovery through the reuse and recycling of materials and waste diversion from landfill.
- 12.2 It is recommended to develop a construction management plan before commencement of the development. The construction management plan will appropriately demonstrate how the impacts of air/water pollution, noise and vibration will be mitigated during the construction of the development. Where feasible, timber used on site will be reclaimed, reused or responsibly sourced.
- 12.3 The following sustainable construction practices will be considered within the development:
- Reducing construction and excavation waste to landfill;
 - Ensuring the products used in construction are responsibly sourced;
 - Conducting biodiversity surveys and following up with necessary actions;
 - Best practice site management principles through registering the site with the Considerate Constructor Scheme to commit to managing the site beyond best practice.
- 12.4 As part of achieving a sustainable construction approach, the main contractor will be encouraged to commit to reducing the impact of the construction processes on the environment through monitoring and mitigating construction site impacts throughout the construction period. Best practice pollution prevention policies will be encouraged with respect to air (dust) and water pollution arising from site activities. To minimise air (dust) pollution, skips will be covered, dust-generating site activities will be dampened down, and wet cutters will be used. Low-emission and efficient equipment will be used on-site.

Construction Waste

- 12.5 Waste reduction and recycling strategy shall be based upon the following waste hierarchy.
- Prevention
 - Preparing for re-use
 - Recycling
 - Other recovery
 - Disposal
- 12.6 As a primary objective, and in accordance with the waste hierarchy, the applicant will seek to prevent waste in the first instance. This will be achieved through a site waste management plan that begins with the planning and design process and filters down through the management of the construction process and across the lifetime of the development.
- 12.7 On-site waste will be minimised, and a high proportion of the waste that is produced will be diverted from landfill, through either:
- Re-use on site (in situ or for new applications) or re-use on other sites;
 - Salvaged/reclaimed for re-use;
 - Returned to the suppliers via 'take-back' schemes;
 - Recovered and recycled using an approved waste management contractor.

- 12.8 Where it is not possible to reduce or re-use materials on site, opportunities to recycle the materials off-site will be explored, where feasible.
- 12.9 The applicant will collaborate with a principal contractor for the company in delivering the objective of maintaining the proportion of waste diverted to landfill to divert at least 70% or above.

Monitoring and Review

- 12.10 The applicant will monitor and review their waste management commitments by defining the following:
- Waste minimisation actions to be undertaken
 - Procedures for minimising hazardous waste
 - Procedures for sorting, reusing, and recycling construction waste into defined waste groups, whether on-site or through a licensed external contractor. The delivery of this target will be managed through the effective implementation of an on-site plan based on the waste hierarchy defined earlier.

Operational Waste

- 12.11 A vehicular access route has been designed for both refuse, delivery vehicles and emergency service vehicles to access the site, based on the swept path analysis conducted in accordance with WSCC Design Guidance. Bin stores shall be strategically located to facilitate kerbside collection throughout the development. All refuse storage areas will be designed to accommodate the necessary capacity for all waste streams and will be positioned within the specified collection distance for waste management operatives in accordance with the Mid Sussex District local plan.

Management

- 12.12 The Applicant shall take steps to reduce the adverse impact of the construction process on the quality of the development area and its surroundings.
- 12.13 The Applicant can consider the following measures to ensure that the sustainable construction practices have been considered in the early stages of development, design and will continue through to construction.
- Stakeholder participation shall be encouraged during the design development process to ensure all interests, environmental and social considerations are reflected within the scheme design.
 - To maximise every opportunity for a sustainable development from concept design through to developed design, enhancing the development schemes achieved standard, the applicant may consider appointing an assigned individual to work alongside the project team.
 - Applicant shall monitor construction site impacts for both utility consumption and transportation by appointing an assigned individual.
 - The impact of transport movement from the delivery of the majority of construction materials to, and waste from, the site should be monitored, and data collected.
- 12.14 The Applicant will ensure that the principal contractor, and other contractors and workers on site during the construction process, are all aware of and follow the sustainability requirements to minimise the possible negative effects of construction, such as air pollution, noise and vibration, traffic congestion, dust and contamination of land and water.

13.0 CONCLUSION AND RECOMMENDATIONS

- 13.1 The Energy hierarchy approach of “Be lean” – “Be clean” – “Be green” is fully adopted by implementing
- Passive design measures and ‘Fabric First’ approach (low U-values)
 - High efficiency services, i.e., low energy lights, high efficiency ventilation
 - LZC technologies: Air source heat pump and photovoltaic panels
- 13.2 Excluded renewable sources are:
- Biomass
 - Gas CHP
 - Wind turbines
 - Solar thermal panel
- 13.3 The proposed development is expected to achieve significant reductions in regulated CO₂ emissions through the implementation of energy-efficient measures and low- and zero-carbon (LZC) technologies. The development is designed to achieve the following site-wide reductions relative to a 2021 Part L compliant baseline:
- An overall reduction of 78% in regulated CO₂ emissions.
 - A 55% reduction in regulated CO₂ emissions through the integration of LZC technologies (Be Green stage).
 - A 23% reduction in regulated CO₂ emissions through improved building fabric and energy efficiency measures implemented at the Be Lean stage.
- 13.4 Implementing Circular economy strategies, site waste management plan and resource efficiency benchmarks.
- 13.5 Adhering to best practice policies for air, water, noise, and ground pollution.
- 13.6 Achieving a water consumption target of 110 litres/person/day with low water-consuming fittings.
- 13.7 Promoting sustainable transport options, such as provisions for cycle storage and car parking.
- 13.8 Ensuring high build quality beyond minimum Building Regulations standards and using responsibly sourced materials.
- 13.9 Prioritising health and wellbeing through design and operational procedures, including adequate daylight, indoor air quality, and thermal comfort.
- 13.10 Enhancing the ecological value of the site through measures such as tree planting and the inclusion of native plant species.
- 13.11 The energy and sustainability assessment demonstrates that the proposed measures comply with the requirements set out in the Mid Sussex District Local Plan and Part L of the Building Regulations. Therefore, the energy and sustainability strategy supports the planning application for Land West of Gatesmead.

14.0 DISCLAIMER

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APPENDIX A

Carbon Reporting Spreadsheet – Outline Application

The applicant should complete all the light blue cells including information on the modelled units, the area per unit, the number of units, the TER/DER/BER and the TFEE/DFEE.

[illegible][illegible]

Sum	0	0	0.0	0.0	0.0	0.0	0.0		0	0	0	0	0	0	0	0	0
SITE-WIDE ENERGY CONSUMPTION AND CO ₂ ANALYSIS																	
Total Sum	5,955	-	-	-	-	-		64,217	-7,427	56,874	49,447	14,770	56,874	49,447	0	13,859	35,587

Applicants can use the 'be seen' methodology or an alternative predictive energy modelling methodology to fill in this tab.

Where 'be seen' reporting is used the reported EUI and space heating demand should align with energy consumption data reported in the planning stage submission for the 'be seen' policy, submitted via the online webform.

Residential predicted energy use

Building type	GIA (m ²)	EUI & space heating demand (kWh/year)									Has the following energy use been included?	Results		Table 4 of the guidance comparison		Methodology used			
		Space heating demand	Annual Electricity Use	Annual Gas Use	Annual Oil Use	Annual Biomass Use	Annual District Htg Use	Annual District Clg Use	Elec Generation, Gross	Solar Thermal Generation	Regulated	Unregulated	EUI (kWh/m ² /year) (excluding renewable energy)	Space heating demand (kWh/m ² /year) (excluding renewable energy)	EUI value from Table 4 of the guidance (kWh/m ² /year) (excluding renewable energy)	Space heating demand from Table 4 of the guidance (kWh/m ² /year) (excluding renewable energy)	Software	Operational energy use assessment	notes (if expected performance differs from the Table 4 values in the guidance or other software used)
Residential use (total)	5998.21	32104.07	132686.07										22.12094442	5.352275095	35	15			
Landlord Circulation (in Residential Blocks)																			
Total	5998.21	32104.07	132686.07	0	0	0	0	0	0	0									

[illegible]

Part L 2021 Performance

ResidentialNon-residential

Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for residential buildings

	Carbon Dioxide Emissions for residential buildings (Tonnes CO ₂ per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	64.2	-
After energy demand reduction (be lean)	49.4	-
After heat network connection (be clean)	49.4	-
After renewable energy (be green)	13.9	-

Table 2: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for residential buildings

	Regulated residential carbon dioxide savings	
	(Tonnes CO ₂ per annum)	(%)
Be lean: savings from energy demand reduction	14.8	23%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	35.6	55%
Cumulative on site savings	50.4	78%
Annual savings from off-set payment	13.9	-
(Tonnes CO ₂)		
Cumulative savings for off-set payment	416	-
Cash in-lieu contribution (£)	39,499	

*carbon price is based on GLA recommended price of £95 per tonne of carbon dioxide unless Local Planning Authority price is inputted in the 'Development Information' tab

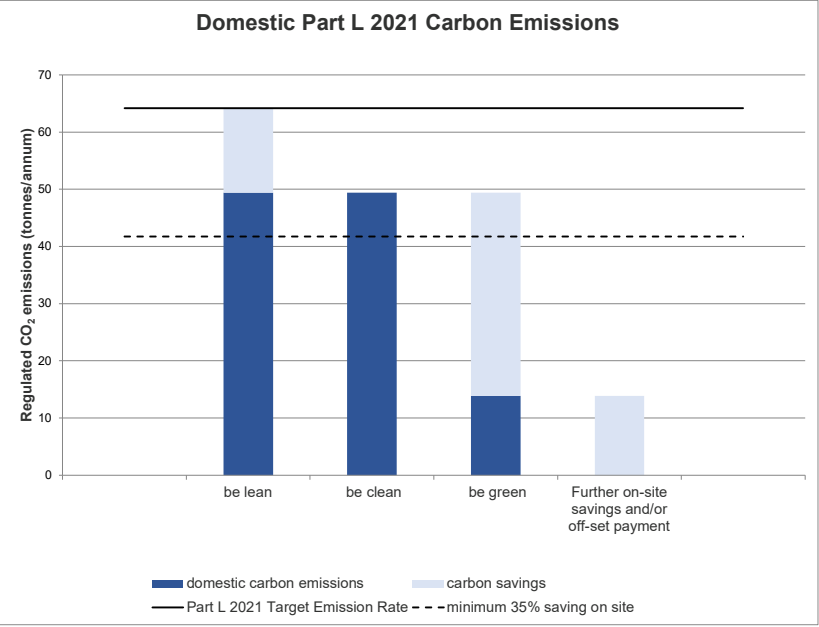


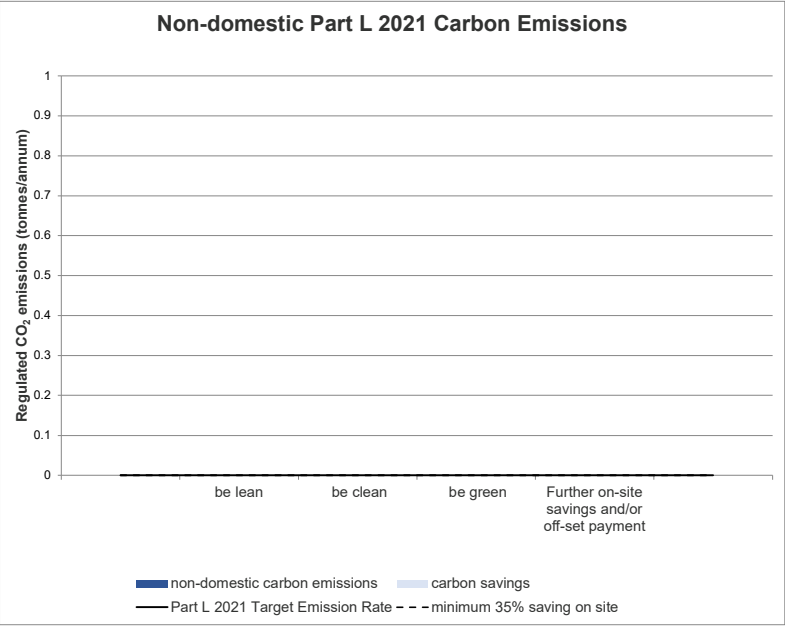
Table 3: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for non-residential buildings

	Carbon Dioxide Emissions for non-residential buildings (Tonnes CO ₂ per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	0.0	
After energy demand reduction (be lean)	0.0	
After heat network connection (be clean)	0.0	
After renewable energy (be green)	0.0	

Table 4: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for non-residential buildings

	Regulated non-residential carbon dioxide savings	
	(Tonnes CO ₂ per annum)	(%)
Be lean: savings from energy demand reduction	0.0	0%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	0.0	0%
Total Cumulative Savings	0.0	0%
Annual savings from off-set payment	0.0	-
(Tonnes CO ₂)		
Cumulative savings for off-set payment	0	-
Cash in-lieu contribution (£)	0	

*carbon price is based on GLA recommended price of £95 per tonne of carbon dioxide unless Local Planning Authority price is inputted in the 'Development Information' tab



SITE-WIDE

	Total regulated emissions (Tonnes CO ₂ / year)	CO ₂ savings (Tonnes CO ₂ / year)	Percentage savings (%)
Part L 2021 baseline	64.2		
Be lean	49.4	14.8	23%
Be clean	49.4	0.0	0%
Be green	13.9	35.6	55%
Total Savings	-	50.4	78%
	-	CO ₂ savings off-set (Tonnes CO ₂)	-
Off-set	-	415.8	-

	Target Fabric Energy Efficiency (kWh/m ²)	Dwelling Fabric Energy Efficiency (kWh/m ²)	Improvement (%)
Development total	43.99	36.97	16%

	Area weighted non-residential cooling demand (MJ/m ²)	Total non-residential cooling demand (MJ/year)
Actual		
Notional		

EUI & space heating demand (predicted energy use)

Residential

Building type	EUI (kWh/m ² /year) (excluding renewable energy)	Space heating demand (kWh/m ² /year) (excluding renewable energy)	EUI value from Table 4 of the guidance (kWh/m ² /year) (excluding renewable energy)	Space heating demand from Table 4 of the guidance(kWh/m ² /year) (excluding renewable energy)	Methodology used (e.g. 'be seen' methodology or an alternative predictive energy modelling methodology)	Explanatory notes (if expected performance differs from the Table 4 values in the guidance)
Residential	22.12094442	5.352275095	35	15	& dwellings / & Landlord Circulation	

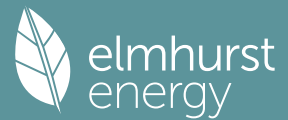
Non-residential

Building type	EUI (kWh/m ² /year) (excluding renewable energy)	Space heating demand (kWh/m ² /year) (excluding renewable energy)	EUI value from Table 4 of the guidance (kWh/m ² /year) (excluding renewable energy)	Space heating demand from Table 4 of the guidance(kWh/m ² /year) (excluding renewable energy)	Methodology used (e.g. 'be seen' methodology or an alternative predictive energy modelling methodology)	Explanatory notes (if expected performance differs from the Table 4 values in the guidance)

APPENDIX B

SAP Worksheets – Baseline & Be Lean Case

Full SAP Calculation Printout



Plot Reference	1B2P Mas				Issued on Date	30/03/2026	
Assessment Reference	BeLean			Plot Type Ref			
Plot Address	Itchen, Land West of Gatesmead, Haywards Heath, RH161SN				SAP Version	10.2	
SAP Rating	92 A	DER	11.76	TER	15.04		
Environmental	92 A	% DER < TER				21.81	
CO ₂ Emissions (t/year)	0.52	DFEE	33.69	TFEE	43.94		
Compliance Check	See BREL	% DFEE < TFEE				23.33	
% DPER < TPER	20.47	DPER	62.97	TPER	79.18		
Assessor Details	Mr. Mirza Baig				Assessor ID	CK52-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	50.6000 (1b)	2.4800 (2b)	125.4880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.6000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	125.4880 (5)

2. Ventilation rate

	m ³ 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)
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	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (21)

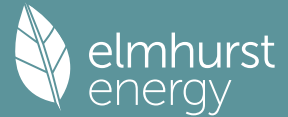
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (22b)
Balanced mechanical ventilation with heat recovery												
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)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												73.6000 (23c)
Effective ac	0.3232	0.3195	0.3157	0.2970	0.2932	0.2745	0.2745	0.2707	0.2820	0.2932	0.3007	0.3082 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			10.0000	1.0536	10.5364		(27)
Heatloss Floor 1			50.4600	0.1000	5.0460	110.0000	5550.6000 (28a)
External Wall GF	77.6700	10.0000	67.6700	0.1600	10.8272	190.0000	12857.3000 (29a)
Total net area of external elements Aum(A, m ²)			128.1300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.4096		(33)
Main dwelling							
Party Ceiling 1			50.4600			30.0000	1513.8000 (32b)
Internal Wall 1			90.2300			75.0000	6767.2500 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	26688.9500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							527.4496 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E5 Ground floor (normal)				31.3800	0.0560	1.7573	
E6 Intermediate floor within a dwelling				31.3800	0.0050	0.1569	

6. Solar gains													
[Jan]		Area		Solar flux		g		FF		Access		Gains	
		m2		Table 6a		Specific data		Specific data		factor		W	
				W/m2		or Table 6b		or Table 6c		Table 6d			
North		1.5600		10.6334		0.4000		1.0000		0.7700		4.5982 (74)	
East		6.8800		19.6403		0.4000		1.0000		0.7700		37.4567 (76)	
West		1.5600		19.6403		0.4000		1.0000		0.7700		8.4931 (80)	
Solar gains		50.5480	98.6749	162.9638	239.8801	296.8975	305.4412	290.1556	247.1206	190.1202	117.1193	62.9664	41.6201 (83)
Total gains		451.0962	506.8395	555.4039	618.2252	657.1930	650.0887	622.4668	580.5885	533.1471	474.8336	441.6077	434.5403 (84)

Full SAP Calculation Printout



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	170.6278	171.2398	171.8562	175.0062	175.6501	178.9420	178.9420	179.6153	177.6106	175.6501	174.3670	173.1025
alpha	12.3752	12.4160	12.4571	12.6671	12.7100	12.9295	12.9295	12.9744	12.8407	12.7100	12.6245	12.5402
util living area	0.9989	0.9947	0.9681	0.8148	0.5969	0.4079	0.2929	0.3270	0.5401	0.8854	0.9935	0.9993 (86)
MIT	20.6807	20.7760	20.8979	20.9897	20.9997	21.0000	21.0000	21.0000	20.9999	20.9784	20.8229	20.6683 (87)
Th 2	20.5707	20.5722	20.5737	20.5814	20.5829	20.5906	20.5906	20.5921	20.5875	20.5829	20.5799	20.5768 (88)
util rest of house												
	0.9986	0.9931	0.9598	0.7904	0.5703	0.3818	0.2656	0.2980	0.5079	0.8602	0.9912	0.9991 (89)
MIT 2	20.2728	20.3687	20.4877	20.5742	20.5828	20.5906	20.5906	20.5921	20.5875	20.5679	20.4223	20.2661 (90)
Living area fraction												
MIT	20.4632	20.5588	20.6792	20.7682	20.7774	20.7817	20.7817	20.7825	20.7800	20.7595	20.6093	20.4538 (92)
Temperature adjustment												0.0000
adjusted MIT	20.4632	20.5588	20.6792	20.7682	20.7774	20.7817	20.7817	20.7825	20.7800	20.7595	20.6093	20.4538 (93)

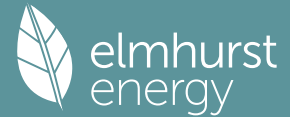
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9985	0.9930	0.9620	0.8015	0.5827	0.3940	0.2783	0.3116	0.5229	0.8712	0.9914	0.9990 (94)
Useful gains	450.4202	503.3119	534.2825	495.4827	382.9592	256.1084	173.2490	180.8884	278.7974	413.6940	437.8060	434.0964 (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	702.2741	677.9272	611.6664	502.7581	383.1272	256.1093	173.2490	180.8884	278.8297	428.8002	574.3777	696.1155 (97)
Space heating kWh	187.3793	117.3415	57.5736	5.2383	0.1250	0.0000	0.0000	0.0000	0.0000	11.2390	98.3316	194.9422 (98a)
Space heating requirement - total per year (kWh/year)												672.1705
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	187.3793	117.3415	57.5736	5.2383	0.1250	0.0000	0.0000	0.0000	0.0000	11.2390	98.3316	194.9422 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												672.1705
Space heating per m2										(98c) / (4) =		13.2840 (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 %)												88.8000 (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	187.3793	117.3415	57.5736	5.2383	0.1250	0.0000	0.0000	0.0000	0.0000	11.2390	98.3316	194.9422 (98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (210)
Space heating fuel (main heating system)	211.0127	132.1413	64.8351	5.8990	0.1407	0.0000	0.0000	0.0000	0.0000	12.6565	110.7338	219.5295 (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	216.1269	191.2328	203.2353	178.6771	173.2391	156.1251	154.0135	160.0566	161.7503	180.3571	191.7962	213.7483 (64)
Efficiency of water heater (217)m	83.7413	82.9988	81.6263	80.0310	79.8058	79.8000	79.8000	79.8000	79.8000	80.2773	82.6387	79.8000 (216)
Fuel for water heating, kWh/month	258.0887	230.4041	248.9828	223.2598	217.0757	195.6455	192.9994	200.5722	202.6946	224.6677	232.0901	254.9059 (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	16.7700	15.1471	16.7700	16.2290	16.7700	16.2290	16.7700	16.7700	16.2290	16.7700	16.2290	16.7700 (231)
Lighting	15.9548	12.7996	11.5246	8.4434	6.5219	5.3285	5.9495	7.7334	10.0449	13.1795	14.8862	16.3983 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-25.2607	-35.9784	-52.3584	-59.6627	-65.0586	-61.1307	-60.4799	-56.7799	-50.2372	-41.5941	-27.9368	-21.8001 (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	-13.5564	-28.7961	-57.9599	-88.1856	-117.5956	-118.4474	-116.7251	-98.0449	-71.0217	-41.2114	-18.1058	-10.6832 (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												756.9488 (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												2681.3867 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7280)												
mechanical ventilation fans (SFP = 0.7280)												111.4534 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												197.4534 (231)
Electricity for lighting (calculated in Appendix L)												128.7646 (232)

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Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	-1338.6105	(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	2425.9430	(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	756.9488	0.2100	158.9592 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2681.3867	0.2100	563.0912 (264)
Space and water heating			722.0504 (265)
Pumps, fans and electric keep-hot	197.4534	0.1387	27.3892 (267)
Energy for lighting	128.7646	0.1443	18.5847 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-558.2774	0.1343	-74.9703
PV Unit electricity exported	-780.3331	0.1256	-98.0099
Total			-172.9801 (269)
Total CO2, kg/year			595.0443 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.7600 (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	756.9488	1.1300	855.3521 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2681.3867	1.1300	3029.9670 (278)
Space and water heating			3885.3191 (279)
Pumps, fans and electric keep-hot	197.4534	1.5128	298.7075 (281)
Energy for lighting	128.7646	1.5338	197.5035 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-558.2774	1.4963	-835.3453
PV Unit electricity exported	-780.3331	0.4610	-359.7539
Total			-1195.0991 (283)
Total Primary energy kWh/year			3186.4310 (286)
Dwelling Primary energy Rate (DPER)			62.9700 (287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)

CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

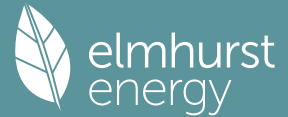
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	50.6000	2.4800	125.4880
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.6000		
Dwelling volume			125.4880

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)
Infiltration due to chimneys, flues and fans	(6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 20.0000 / (5) = 0.1594 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4094 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.4094 (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
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
Adj infilt rate	0.5220	0.5117	0.5015	0.4503	0.4401	0.3889	0.3889	0.3787	0.4094	0.4401	0.4606	0.4810
Effective ac	0.6362	0.6309	0.6257	0.6014	0.5968	0.5756	0.5756	0.5717	0.5838	0.5968	0.6061	0.6157

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K						
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K						
TER Opening Type			10.0000	1.1450	11.4504			(27)					
Heatloss Floor 1			50.4600	0.1300	6.5598			(28a)					
External Wall GF	77.6700	10.0000	67.6700	0.1800	12.1806			(29a)					
Total net area of external elements Aum(A, m2)			128.1300					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.1908			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							527.4496	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value		Total						
E5 Ground floor (normal)				31.3800	0.1600		5.0208						
E6 Intermediate floor within a dwelling				31.3800	0.0000		0.0000						
E16 Corner (normal)				14.8500	0.0900		1.3365						
E17 Corner (inverted - internal area greater than external area)				4.9500	-0.0900		-0.4455						
E2 Other lintels (including other steel lintels)				7.0000	0.0500		0.3500						
E3 Sill				6.0000	0.0500		0.3000						
E4 Jamb				14.6000	0.0500		0.7300						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.2918	(36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	37.4826	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	26.3465	26.1275	25.9128	24.9043	24.7156	23.8372	23.8372	23.6746	24.1756	24.7156	25.0973	25.4963	(38)
Average = Sum(39)m / 12 =	63.8291	63.6100	63.3953	62.3869	62.1982	61.3198	61.3198	61.1572	61.6581	62.1982	62.5799	62.9789	(39)
												62.3859	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.2614	1.2571	1.2529	1.2329	1.2292	1.2119	1.2119	1.2086	1.2185	1.2292	1.2368	1.2446	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

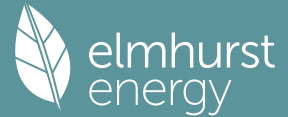
4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.7078 (42)
Hot water usage for mixer showers	52.8533	52.0590	50.9016	48.6871	47.0528	45.2303	44.1944	45.3430	46.6022	48.5590	50.8211	52.6508 (42a)	
Hot water usage for baths	22.8519	22.5125	22.0346	21.1534	20.4935	19.7619	19.3667	19.8413	20.3580	21.1409	22.0402	22.7746 (42b)	
Hot water usage for other uses	32.1193	30.9514	29.7834	28.6154	27.4474	26.2795	26.2795	27.4474	28.6154	29.7834	30.9514	32.1193 (42c)	
Average daily hot water use (litres/day)												99.1157 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	107.8245	105.5229	102.7196	98.4559	94.9938	91.2716	89.8405	92.6317	95.5756	99.4833	103.8127	107.5448 (44)	
Energy content (annual)	170.7677	150.2632	157.8761	134.7811	127.8799	112.2291	108.6543	114.6974	117.8543	134.9979	147.9002	168.3891 (45)	
Distribution loss (46)m = 0.15 x (45)m	25.6152	22.5395	23.6814	20.2172	19.1820	16.8344	16.2981	17.2046	17.6781	20.2497	22.1850	25.2584 (46)	
Water storage loss (or HIU 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	217.3626	192.3489	204.4710	179.8730	174.4748	157.3210	155.2492	161.2923	162.9461	181.5928	192.9921	214.9840 (62)	
WWHRS	-24.1623	-21.3694	-22.3768	-18.5288	-17.2682	-14.7765	-13.8506	-14.7288	-15.2884	-18.0233	-20.4182	-23.7149 (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	193.2003	170.9795	182.0943	161.3441	157.2066	142.5444	141.3986	146.5636	147.6577	163.5695	172.5739	191.2691 (64)	
12Total per year (kWh/year)												1970.4016 (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	94.0562	83.6311	89.7697	80.8882	79.7960	73.3897	73.4035	75.4128	75.2600	82.1627	85.2503	93.2653 (65)	

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

Metabolic gains (Table 5), Watts													
(66)m	85.3889	85.3889	85.3889	85.3889	85.3889	85.3889	85.3889	85.3889	85.3889	85.3889	85.3889	85.3889	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	75.6747	83.7827	75.6747	78.1972	75.6747	78.1972	75.6747	75.6747	78.1972	75.6747	78.1972	75.6747	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	148.7922	150.3362	146.4453	138.1622	127.7063	117.8792	111.3141	109.7701	113.6609	121.9440	132.4000	142.2271	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5389	31.5389	31.5389	31.5389	31.5389	31.5389	31.5389	31.5389	31.5389	31.5389	31.5389	31.5389	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.3111	-68.3111	-68.3111	-68.3111	-68.3111	-68.3111	-68.3111	-68.3111	-68.3111	-68.3111	-68.3111	-68.3111	(71)
Water heating gains (Table 5)	126.4196	124.4510	120.6582	112.3447	107.2527	101.9301	98.6606	101.3613	104.5278	110.4338	118.4032	125.3566	(72)
Total internal gains	402.5031	410.1866	394.3950	380.3208	362.2504	346.6232	334.2661	335.4228	345.0026	359.6692	380.6170	394.8750	(73)

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6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W		
North				1.5600	10.6334	0.6300	0.7000	0.7700		5.0695 (74)		
East				6.8800	19.6403	0.6300	0.7000	0.7700		41.2960 (76)		
West				1.5600	19.6403	0.6300	0.7000	0.7700		9.3636 (80)		
Solar gains	55.7291	108.7890	179.6676	264.4679	327.3295	336.7490	319.8966	272.4505	209.6075	129.1240	69.4205	45.8862 (83)
Total gains	458.2323	518.9756	574.0625	644.7887	689.5799	683.3721	654.1627	607.8733	554.6101	488.7932	450.0375	440.7612 (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	116.1476	116.5476	116.9423	118.8327	119.1932	120.9005	120.9005	121.2221	120.2371	119.1932	118.4662	117.7155		
alpha	8.7432	8.7698	8.7962	8.9222	8.9462	9.0600	9.0600	9.0815	9.0158	8.9462	8.8977	8.8477		
util living area	0.9996	0.9987	0.9940	0.9548	0.8049	0.5727	0.4124	0.4626	0.7495	0.9788	0.9986	0.9997	(86)	
MIT	20.3214	20.4351	20.6105	20.8441	20.9738	20.9988	20.9999	20.9998	20.9891	20.8114	20.5295	20.3096	(87)	
Th 2	19.8712	19.8746	19.8779	19.8937	19.8967	19.9105	19.9105	19.9131	19.9052	19.8967	19.8907	19.8845	(88)	
util rest of house	0.9994	0.9978	0.9893	0.9247	0.7257	0.4762	0.3103	0.3534	0.6409	0.9576	0.9974	0.9996	(89)	
MIT 2	19.1034	19.2516	19.4763	19.7649	19.8832	19.9102	19.9105	19.9131	19.9016	19.7384	19.3859	19.0993	(90)	
Living area fraction	fLA = Living area / (4) =												0.4668	(91)
MIT	19.6719	19.8040	20.0057	20.2687	20.3923	20.4184	20.4191	20.4204	20.4092	20.2393	19.9197	19.6643	(92)	
Temperature adjustment													0.0000	
adjusted MIT	19.6719	19.8040	20.0057	20.2687	20.3923	20.4184	20.4191	20.4204	20.4092	20.2393	19.9197	19.6643	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9993	0.9977	0.9900	0.9365	0.7629	0.5214	0.3580	0.4044	0.6926	0.9658	0.9974	0.9995	(94)
Useful gains	457.9182	517.7812	568.3289	603.8359	526.1099	356.3072	234.1705	245.8356	384.1290	472.0739	448.8807	440.5443	(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	981.1771	948.0464	856.1988	709.2582	540.6441	356.7805	234.1842	245.8750	389.0160	599.5447	802.2558	973.9225	(97)
Space heating kWh	389.3046	289.1382	214.1752	75.9041	10.8134	0.0000	0.0000	0.0000	0.0000	94.8382	254.4301	396.8334	(98a)
Space heating requirement - total per year (kWh/year)													1725.4372
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	389.3046	289.1382	214.1752	75.9041	10.8134	0.0000	0.0000	0.0000	0.0000	94.8382	254.4301	396.8334	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)													1725.4372
Space heating per m2													(98c) / (4) = 34.0995 (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	389.3046	289.1382	214.1752	75.9041	10.8134	0.0000	0.0000	0.0000	0.0000	94.8382	254.4301	396.8334	(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)	421.7818	313.2591	232.0425	82.2363	11.7155	0.0000	0.0000	0.0000	0.0000	102.7500	275.6556	429.9386	(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	193.2003	170.9795	182.0943	161.3441	157.2066	142.5444	141.3986	146.5636	147.6577	163.5695	172.5739	191.2691	(64)
Efficiency of water heater	85.5981	85.2281	84.4246	82.4743	80.3239	79.8000	79.8000	79.8000	79.8000	82.8830	84.9289	85.6580	(216)
Fuel for water heating, kWh/month	225.7063	200.6140	215.6886	195.6296	195.7157	178.6271	177.1912	183.6636	185.0348	197.3499	203.1981	223.2938	(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	15.7237	12.6141	11.3576	8.3211	6.4275	5.2513	5.8633	7.6214	9.8994	12.9886	14.6706	16.1607	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-24.1086	-34.2187	-49.5390	-56.1497	-60.9796	-57.1301	-56.4738	-53.1246	-47.2438	-39.3785	-26.6048	-20.8205	(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	-12.9355	-27.2867	-54.3527	-81.7866	-108.2608	-108.7704	-107.4421	-90.8774	-66.5198	-39.0180	-17.2744	-10.2196	(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)													

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(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												1869.3794	(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												2381.7128	(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)												126.8994	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1250.5159	(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												3213.4757	(238)

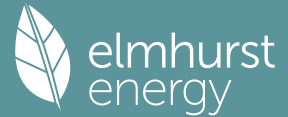
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1869.3794	0.2100	392.5697	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2381.7128	0.2100	500.1597	(264)
Space and water heating			892.7294	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	126.8994	0.1443	18.3155	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-525.7717	0.1344	-70.6673	
PV Unit electricity exported	-724.7442	0.1259	-91.2108	
Total			-161.8781	(269)
Total CO2, kg/year			761.0960	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.0400	(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	1869.3794	1.1300	2112.3987	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2381.7128	1.1300	2691.3355	(278)
Space and water heating			4803.7342	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	126.8994	1.5338	194.6425	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-525.7717	1.4967	-786.9407	
PV Unit electricity exported	-724.7442	0.4620	-334.8057	
Total			-1121.7464	(283)
Total Primary energy kWh/year			4006.7311	(286)
Target Primary Energy Rate (TPER)			79.1800	(287)

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Plot Reference	2B4P House			Issued on Date	30/03/2026	
Assessment Reference	BeLean	Plot Type Ref				
Plot Address	Severn, Land West of Gatesmead, Haywards Heath, RH161SN			SAP Version	10.2	
SAP Rating	90 B	DER	11.09	TER	11.95	
Environmental	91 B	% DER < TER				7.20
CO ₂ Emissions (t/year)	0.77	DFEE	33.85	TFEE	39.18	
Compliance Check	See BREL	% DFEE < TFEE				13.59
% DPER < TPER	4.04	DPER	59.99	TPER	62.52	
Assessor Details	Mr. Mirza Baig			Assessor ID	CK52-0001	
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	39.8400 (1b)	x 2.7400 (2b)	= 109.1616 (1b) - (3b)
First floor	39.8400 (1c)	x 2.4600 (2c)	= 98.0064 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.6800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	207.1680 (5)

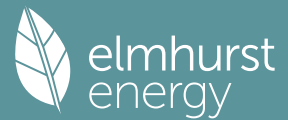
2. Ventilation rate

	m ³ 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)											
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	3.0000 (17)											
Infiltration rate	0.1500 (18)											
Number of sides sheltered	0 (19)											
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)											
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (21)											
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (22b)
Balanced mechanical ventilation with heat recovery												
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)											
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	73.6000 (23c)											
Effective ac	0.3232	0.3195	0.3157	0.2970	0.2932	0.2745	0.2745	0.2707	0.2820	0.2932	0.3007	0.3082 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Front Door			2.2000	1.0000	2.2000		(26)
Window			10.6700	1.0536	11.2423		(27)
Heatloss Floor 1			39.8400	0.1000	3.9840	110.0000	4382.4000 (28a)
External Wall GF	92.8900	12.8700	80.0200	0.1600	12.8032	190.0000	15203.8000 (29a)
External Roof 1	39.8400		39.8400	0.1000	3.9840	9.0000	358.5600 (30)
Total net area of external elements Aum(A, m ²)			172.5700				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 34.2135		(33)
Main dwelling							
Party Wall 1			43.9400	0.0000	0.0000	140.0000	6151.6000 (32)
Internal Wall 1			171.7400			75.0000	12880.5000 (32c)
Internal Ceiling 1			39.8400			9.0000	358.5600 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 39335.4200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							493.6674 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	17.8800	0.0560	1.0013
E6 Intermediate floor within a dwelling	17.8800	0.0050	0.0894
E10 Eaves (insulation at ceiling level)	8.4600	0.0500	0.4230
E12 Gable (insulation at ceiling level)	9.4200	0.0570	0.5369
E16 Corner (normal)	10.3900	0.0360	0.3740
E18 Party wall between dwellings	10.3900	0.0390	0.4052
E2 Other lintels (including other steel lintels)	8.9000	0.0620	0.5518
E3 Sill	6.1000	0.0390	0.2379
E4 Jamb	17.5000	0.0520	0.9100
P1 Party wall - Ground floor	8.4600	0.3200	2.7072
P4 Party wall - Roof (insulation at ceiling level)	8.4600	0.0420	0.3553
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			7.5921 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	41.8056 (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	22.0991	21.8428	21.5864	20.3045	20.0482	18.7663	18.7663	18.5099	19.2791	20.0482	20.5609	21.0736	(38)
Heat transfer coeff	63.9048	63.6484	63.3920	62.1102	61.8538	60.5719	60.5719	60.3156	61.0847	61.8538	62.3665	62.8793	(39)
Average = Sum(39)m / 12 =												62.0461	
HLP	0.8020	0.7988	0.7956	0.7795	0.7763	0.7602	0.7602	0.7570	0.7666	0.7763	0.7827	0.7891	(40)
HLP (average)												0.7787	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.4568 (42)
Hot water usage for mixer showers	65.4115	64.4285	62.9961	60.2554	58.2328	55.9772	54.6952	56.1168	57.6751	60.0969	62.8965	65.1609	(42a)
Hot water usage for baths	28.2523	27.8327	27.2419	26.1524	25.3366	24.4321	23.9435	24.5302	25.1691	26.1370	27.2489	28.1568	(42b)
Hot water usage for other uses	39.7897	38.3428	36.8959	35.4490	34.0021	32.5552	32.5552	34.0021	35.4490	36.8959	38.3428	39.7897	(42c)
Average daily hot water use (litres/day)												122.6740	(43)
Daily hot water use	133.4535	130.6040	127.1338	121.8568	117.5715	112.9645	111.1939	114.6491	118.2932	123.1298	128.4881	133.1074	(44)
Energy conte	211.3578	185.9784	195.4000	166.8158	158.2739	138.9031	134.4794	141.9595	145.8673	167.0859	183.0549	208.4140	(45)
Energy content (annual)										Total = Sum(45)m =		2037.5900	
Distribution loss (46)m = 0.15 x (45)m	31.7037	27.8968	29.3100	25.0224	23.7411	20.8355	20.1719	21.2939	21.8801	25.0629	27.4582	31.2621	(46)
Water storage loss (or HIU 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	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	256.7170	226.9480	240.7592	210.7118	203.6331	182.7991	179.8386	187.3187	189.7633	212.4451	226.9509	253.7732	(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	256.7170	226.9480	240.7592	210.7118	203.6331	182.7991	179.8386	187.3187	189.7633	212.4451	226.9509	253.7732	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2571.6580	(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	106.5638	94.6135	101.2579	90.5831	88.9134	81.3021	81.0017	83.4889	83.6177	91.8434	95.9826	105.5850	(65)

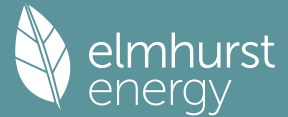
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	122.8381	122.8381	122.8381	122.8381	122.8381	122.8381	122.8381	122.8381	122.8381	122.8381	122.8381	122.8381	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	111.7055	123.6740	111.7055	115.4290	111.7055	115.4290	111.7055	111.7055	115.4290	111.7055	115.4290	111.7055	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	218.7704	221.0406	215.3199	203.1412	187.7677	173.3189	163.6661	161.3960	167.1167	179.2954	194.6688	209.1177	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2838	35.2838	35.2838	35.2838	35.2838	35.2838	35.2838	35.2838	35.2838	35.2838	35.2838	35.2838	(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)	-98.2705	-98.2705	-98.2705	-98.2705	-98.2705	-98.2705	-98.2705	-98.2705	-98.2705	-98.2705	-98.2705	-98.2705	(71)
Water heating gains (Table 5)	143.2309	140.7939	136.0993	125.8098	119.5073	112.9195	108.8733	112.2163	116.1357	123.4455	133.3091	141.9154	(72)
Total internal gains	536.5583	548.3599	525.9761	507.2314	481.8320	461.5189	444.0964	445.1692	458.5328	477.2978	506.2584	525.5900	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
East	3.6600	19.6403	0.4000	1.0000	0.7700	19.9261 (76)
West	7.0100	19.6403	0.4000	1.0000	0.7700	38.1644 (80)

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Solar gains	58.0905	113.6373	187.1445	272.9390	334.4970	342.4172	325.9952	280.0250	217.6567	134.8402	72.4320	47.7708 (83)
Total gains	594.6488	661.9972	713.1205	780.1705	816.3290	803.9361	770.0915	725.1942	676.1896	612.1380	578.6904	573.3608 (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	170.9811	171.6698	172.3641	175.9214	176.6505	180.3889	180.3889	181.1556	178.8747	176.6505	175.1982	173.7696
alpha	12.3987	12.4447	12.4909	12.7281	12.7767	13.0259	13.0259	13.0770	12.9250	12.7767	12.6799	12.5846
util living area	0.9997	0.9985	0.9903	0.9086	0.7023	0.4822	0.3461	0.3826	0.6228	0.9481	0.9980	0.9998 (86)
MIT	20.6274	20.7132	20.8320	20.9663	20.9985	21.0000	21.0000	21.0000	20.9997	20.9503	20.7715	20.6187 (87)
Th 2	20.5990	20.6006	20.6022	20.6103	20.6119	20.6199	20.6199	20.6215	20.6167	20.6119	20.6086	20.6054 (88)
util rest of house	0.9996	0.9980	0.9874	0.8904	0.6738	0.4536	0.3162	0.3511	0.5884	0.9327	0.9973	0.9997 (89)
MIT 2	20.2466	20.3336	20.4525	20.5845	20.6109	20.6199	20.6199	20.6215	20.6165	20.5737	20.3991	20.2437 (90)
Living area fraction									fLA =	Living area / (4) =		0.1958 (91)
MIT	20.3211	20.4079	20.5268	20.6592	20.6868	20.6943	20.6943	20.6956	20.6916	20.6474	20.4720	20.3171 (92)
Temperature adjustment												0.0000
adjusted MIT	20.3211	20.4079	20.5268	20.6592	20.6868	20.6943	20.6943	20.6956	20.6916	20.6474	20.4720	20.3171 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9995	0.9977	0.9867	0.8928	0.6793	0.4592	0.3220	0.3573	0.5952	0.9342	0.9970	0.9997 (94)
Useful gains	594.3528	660.4783	703.6680	696.5645	554.5529	369.1366	248.0009	259.0922	402.4433	571.8711	576.9569	573.1688 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	14.1000	10.6000	7.1000	4.2000	4.2000 (96)
Heat loss rate W	1023.8275	987.0556	889.1871	730.3672	555.8672	369.1445	248.0010	259.0925	402.6438	621.4694	833.9655	1013.4337 (97)
Space heating kWh	319.5292	219.4600	138.0262	24.3380	0.9778	0.0000	0.0000	0.0000	0.0000	36.9011	185.0462	327.5571 (98a)
Space heating requirement - total per year (kWh/year)												1251.8356
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	319.5292	219.4600	138.0262	24.3380	0.9778	0.0000	0.0000	0.0000	0.0000	36.9011	185.0462	327.5571 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1251.8356
Space heating per m2										(98c) / (4) =		15.7108 (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 %)												88.8000 (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	319.5292	219.4600	138.0262	24.3380	0.9778	0.0000	0.0000	0.0000	0.0000	36.9011	185.0462	327.5571 (98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (210)
Space heating fuel (main heating system)	359.8302	247.1396	155.4349	27.4076	1.1011	0.0000	0.0000	0.0000	0.0000	41.5553	208.3854	368.8706 (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	256.7170	226.9480	240.7592	210.7118	203.6331	182.7991	179.8386	187.3187	189.7633	212.4451	226.9509	253.7732 (64)
Efficiency of water heater (217)m	84.5518	83.9846	82.8602	80.6463	79.8387	79.8000	79.8000	79.8000	79.8000	81.0152	83.6059	79.8000 (216)
Fuel for water heating, kWh/month	303.6211	270.2258	290.5608	261.2789	255.0557	229.0715	225.3616	234.7353	237.7986	262.2289	271.4533	299.8507 (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	23.8329	21.5265	23.8329	23.0641	23.8329	23.0641	23.8329	23.8329	23.0641	23.8329	23.0641	23.8329 (231)
Lighting	21.5972	17.3261	15.6002	11.4294	8.8284	7.2129	8.0536	10.4683	13.5973	17.8404	20.1507	22.1975 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-24.4212	-35.0782	-51.1015	-58.7210	-64.9408	-61.3178	-60.7745	-56.7320	-49.9607	-40.9080	-27.2004	-21.0982 (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	-9.7165	-19.9485	-38.0145	-54.9371	-71.1233	-70.8353	-70.3046	-60.5673	-45.9633	-28.1324	-12.8961	-7.7434 (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												1409.7247 (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												3141.2423 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												

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(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7700)	
mechanical ventilation fans (SFP = 0.7700)	194.6136 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	280.6136 (231)
Electricity for lighting (calculated in Appendix L)	174.3020 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1042.4368 (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	3963.4458 (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	1409.7247	0.2100	296.0422 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3141.2423	0.2100	659.6609 (264)
Space and water heating			955.7031 (265)
Pumps, fans and electric keep-hot	280.6136	0.1387	38.9246 (267)
Energy for lighting	174.3020	0.1443	25.1572 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-552.2544	0.1341	-74.0441
PV Unit electricity exported	-490.1823	0.1269	-62.1799
Total			-136.2240 (269)
Total CO2, kg/year			883.5608 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.0900 (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	1409.7247	1.1300	1592.9889 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3141.2423	1.1300	3549.6038 (278)
Space and water heating			5142.5927 (279)
Pumps, fans and electric keep-hot	280.6136	1.5128	424.5123 (281)
Energy for lighting	174.3020	1.5338	267.3502 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-552.2544	1.4955	-825.8915
PV Unit electricity exported	-490.1823	0.4657	-228.2642
Total			-1054.1558 (283)
Total Primary energy kWh/year			4780.2994 (286)
Dwelling Primary energy Rate (DPER)			59.9900 (287)

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

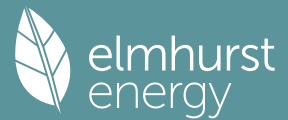
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	39.8400 (1b)	x 2.7400 (2b)	= 109.1616 (1b) - (3b)
First floor	39.8400 (1c)	x 2.4600 (2c)	= 98.0064 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.6800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 207.1680 (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	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1448 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3948 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3948 (21)

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Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	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)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Effective ac	0.5034	0.4935	0.4836	0.4343	0.4244	0.3751	0.3751	0.3652	0.3948	0.4244	0.4442	0.4639	(22b)
	0.6267	0.6218	0.6170	0.5943	0.5901	0.5703	0.5703	0.5667	0.5779	0.5901	0.5986	0.6076	(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			2.2000	1.0000	2.2000			(26)
TER Opening Type			10.6700	1.1450	12.2176			(27)
Heatloss Floor 1			39.8400	0.1300	5.1792			(28a)
External Wall GF	92.8900	12.8700	80.0200	0.1800	14.4036			(29a)
External Roof 1	39.8400		39.8400	0.1100	4.3824			(30)
Total net area of external elements Aum(A, m2)			172.5700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.3828			(33)
Main dwelling								
Party Wall 1			43.9400	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							493.6674	(35)
List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		
E5 Ground floor (normal)				17.8800	0.1600	2.8608		
E6 Intermediate floor within a dwelling				17.8800	0.0000	0.0000		
E10 Eaves (insulation at ceiling level)				8.4600	0.0600	0.5076		
E12 Gable (insulation at ceiling level)				9.4200	0.0600	0.5652		
E16 Corner (normal)				10.3900	0.0900	0.9351		
E18 Party wall between dwellings				10.3900	0.0600	0.6234		
E2 Other lintels (including other steel lintels)				8.9000	0.0500	0.4450		
E3 Sill				6.1000	0.0500	0.3050		
E4 Jamb				17.5000	0.0500	0.8750		
P1 Party wall - Ground floor				8.4600	0.0800	0.6768		
P4 Party wall - Roof (insulation at ceiling level)				8.4600	0.1200	1.0152		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.8091	(36)
Point Thermal bridges							0.0000	
Total fabric heat loss						(33) + (36) + (36a) =	47.1919	(37)

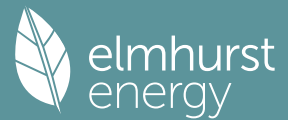
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.4568	(42)
Hot water usage for mixer showers														
65.4115	64.4285	62.9961	60.2554	58.2328	55.9772	54.6952	56.1168	57.6751	60.0969	62.8965	65.1609		(42a)	
Hot water usage for baths														
28.2523	27.8327	27.2419	26.1524	25.3366	24.4321	23.9435	24.5302	25.1691	26.1370	27.2489	28.1568		(42b)	
Hot water usage for other uses														
39.7897	38.3428	36.8959	35.4490	34.0021	32.5552	32.5552	34.0021	35.4490	36.8959	38.3428	39.7897		(42c)	
Average daily hot water use (litres/day)													122.6740	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use														
133.4535	130.6040	127.1338	121.8568	117.5715	112.9645	111.1939	114.6491	118.2932	123.1298	128.4881	133.1074		(44)	
Energy content	211.3578	185.9784	195.4000	166.8158	158.2739	138.9031	134.4794	141.9595	145.8673	167.0859	183.0549	208.4140		(45)
Energy content (annual)										Total = Sum(45)m =		2037.5900		
Distribution loss (46)m = 0.15 x (45)m														
31.7037	27.8968	29.3100	25.0224	23.7411	20.8355	20.1719	21.2939	21.8801	25.0629	27.4582	31.2621		(46)	
Water storage loss (or HIU 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	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	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														
257.9527	228.0641	241.9949	211.9077	204.8688	183.9949	181.0743	188.5544	190.9592	213.6808	228.1467	255.0089		(62)	
WWHRS	-29.9034	-26.4468	-27.6936	-22.9314	-21.3712	-18.2875	-17.1416	-18.2284	-18.9210	-22.3057	-25.2697	-29.3496		(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														
228.0493	201.6173	214.3013	188.9763	183.4976	165.7074	163.9326	170.3260	172.0382	191.3751	202.8770	225.6593		(64)	
12Total per year (kWh/year)													2308.3574	(64)
Electric shower(s)													2308	(64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000	(64a)
Heat gains from water heating, kWh/month														
107.5524	95.5064	102.2464	91.5397	89.9020	82.2587	81.9903	84.4775	84.5744	92.8320	96.9392	106.5736		(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	
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(66)m	122.8381	122.8381	122.8381	122.8381	122.8381	122.8381	122.8381	122.8381	122.8381	122.8381	122.8381	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.5385	132.3462	119.5385	123.5231	119.5385	123.5231	119.5385	119.5385	123.5231	119.5385	123.5231	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	218.7704	221.0406	215.3199	203.1412	187.7677	173.3189	163.6661	161.3960	167.1167	179.2954	194.6688	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2838	35.2838	35.2838	35.2838	35.2838	35.2838	35.2838	35.2838	35.2838	35.2838	35.2838	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.2705	-98.2705	-98.2705	-98.2705	-98.2705	-98.2705	-98.2705	-98.2705	-98.2705	-98.2705	-98.2705	(71)
Water heating gains (Table 5)	144.5597	142.1226	137.4280	127.1385	120.8360	114.2483	110.2020	113.5450	117.4644	124.7742	134.6378	(72)
Total internal gains	545.7200	558.3608	535.1378	516.6543	490.9937	470.9417	453.2581	454.3309	467.9556	486.4595	515.6812	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
East				3.6600	19.6403	0.6300		0.7000		0.7700		21.9685 (76)
West				7.0100	19.6403	0.6300		0.7000		0.7700		42.0763 (80)
Solar gains	64.0448	125.2851	206.3268	300.9153	368.7830	377.5150	359.4097	308.7276	239.9666	148.6614	79.8563	52.6673 (83)
Total gains	609.7648	683.6460	741.4646	817.5695	859.7766	848.4567	812.6678	763.0585	707.9222	635.1209	595.5375	587.4190 (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	121.3567	121.8117	122.2611	124.4169	124.8287	126.7822	126.7822	127.1506	126.0225	124.8287	123.9984	123.1421
alpha	9.0904	9.1208	9.1507	9.2945	9.3219	9.4521	9.4521	9.4767	9.4015	9.3219	9.2666	9.2095
util living area	0.9998	0.9994	0.9974	0.9784	0.8766	0.6462	0.4664	0.5175	0.8125	0.9892	0.9994	0.9999 (86)
MIT	20.3193	20.4204	20.5760	20.7994	20.9539	20.9975	20.9999	20.9997	20.9824	20.7845	20.5193	20.3110 (87)
Th 2	19.9764	19.9799	19.9832	19.9991	20.0020	20.0159	20.0159	20.0184	20.0105	20.0020	19.9960	19.9898 (88)
util rest of house	0.9997	0.9990	0.9954	0.9624	0.8121	0.5493	0.3622	0.4075	0.7140	0.9781	0.9988	0.9998 (89)
MIT 2	19.1930	19.3253	19.5266	19.8149	19.9741	20.0151	20.0159	20.0184	20.0036	19.8042	19.4656	19.1933 (90)
Living area fraction	fLA = Living area / (4) = 0.1958 (91)											
MIT	19.4135	19.5397	19.7321	20.0077	20.1659	20.2075	20.2085	20.2105	20.1953	19.9962	19.6719	19.4122 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.4135	19.5397	19.7321	20.0077	20.1659	20.2075	20.2085	20.2105	20.1953	19.9962	19.6719	19.4122 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9996	0.9988	0.9947	0.9626	0.8239	0.5684	0.3827	0.4291	0.7338	0.9780	0.9985	0.9997 (94)
Ext temp.	609.5367	682.7940	737.5698	786.9642	708.3917	482.2494	310.9720	327.3907	519.4680	621.1534	594.6608	587.2629 (95)
Heat loss rate W	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)
Space heating kWh	1360.7631	1313.1762	1182.5547	975.4935	741.0406	483.2698	310.9939	327.4524	528.4760	822.4653	1107.8112	1349.7885 (97)
Space heating requirement - total per year (kWh/year)	558.9124	423.6169	331.0687	135.7411	24.2908	0.0000	0.0000	0.0000	0.0000	149.7761	369.4682	567.3190 (98a)
Solar heating kWh	2560.1933											
Solar heating contribution - total per year (kWh/year)	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)
Space heating kWh	558.9124	423.6169	331.0687	135.7411	24.2908	0.0000	0.0000	0.0000	0.0000	149.7761	369.4682	567.3190 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2560.1933											
Space heating per m2	(98c) / (4) = 32.1309 (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)											
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating efficiency (main heating system 1)	558.9124	423.6169	331.0687	135.7411	24.2908	0.0000	0.0000	0.0000	0.0000	149.7761	369.4682	567.3190 (98)
Space heating fuel (main heating system)	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 efficiency (main heating system 2)	605.5389	458.9565	358.6877	147.0651	26.3172	0.0000	0.0000	0.0000	0.0000	162.2710	400.2906	614.6468 (211)
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 (212)
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 (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	228.0493	201.6173	214.3013	188.9763	183.4976	165.7074	163.9326	170.3260	172.0382	191.3751	202.8770	225.6593 (64)
Efficiency of water heater (217)m	85.9896	85.6838	85.0316	83.3305	80.7568	79.8000	79.8000	79.8000	79.8000	83.5162	85.3865	79.8000 (216)
Fuel for water heating, kWh/month	265.2055	235.3038	252.0254	226.7792	227.2224	207.6534	205.4294	213.4412	215.5867	229.1474	237.5986	262.2767 (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)

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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	24.8377	19.9258	17.9409	13.1443	10.1530	8.2951	9.2619	12.0390	15.6375	20.5172	23.1742	25.5281	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-37.1749	-52.3504	-75.1576	-84.3924	-90.9009	-84.8065	-83.7638	-79.1378	-70.9406	-59.8234	-40.8516	-32.1473	(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	-21.1587	-44.5024	-88.4410	-132.8165	-175.6026	-176.4376	-174.3551	-147.6227	-108.2033	-63.6279	-28.2451	-16.7316	(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												2773.7738	(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												2777.6695	(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)												200.4548	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1969.1918	(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												3868.7064	(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	2773.7738	0.2100	582.4925	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2777.6695	0.2100	583.3106	(264)
Space and water heating			1165.8031	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	200.4548	0.1443	28.9318	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-791.4472	0.1346	-106.5391	
PV Unit electricity exported	-1177.7446	0.1259	-148.2779	
Total			-254.8170	(269)
Total CO2, kg/year			951.8472	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.9500	(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	2773.7738	1.1300	3134.3644	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2777.6695	1.1300	3138.7666	(278)
Space and water heating			6273.1310	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	200.4548	1.5338	307.4643	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-791.4472	1.4975	-1185.1987	
PV Unit electricity exported	-1177.7446	0.4621	-544.2822	
Total			-1729.4810	(283)
Total Primary energy kWh/year			4981.2152	(286)
Target Primary Energy Rate (TPER)			62.5200	(287)

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Plot Reference	2B4P Mas				Issued on Date	30/03/2026	
Assessment Reference	BeLean			Plot Type Ref			
Plot Address	Itchen, Land West of Gatesmead, Haywards Heath, RH161SN				SAP Version	10.2	
SAP Rating	95 A	DER	8.80	TER	11.88		
Environmental	93 A	% DER < TER				25.93	
CO ₂ Emissions (t/year)	0.53	DFEE	27.77	TFEE	36.34		
Compliance Check	See BREL	% DFEE < TFEE				23.57	
% DPER < TPER	24.52	DPER	46.85	TPER	62.07		
Assessor Details	Mr. Mirza Baig				Assessor ID	CK52-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	70.3000 (1b)	2.4800 (2b)	174.3440 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	174.3440 (5)

2. Ventilation rate

	m ³ 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)
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	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (22b)
Balanced mechanical ventilation with heat recovery												
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)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												73.6000 (23c)
Effective ac	0.3232	0.3195	0.3157	0.2970	0.2932	0.2745	0.2745	0.2707	0.2820	0.2932	0.3007	0.3082 (25)

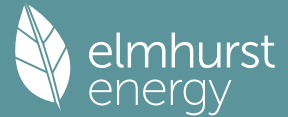
3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			11.5600	1.0536	12.1801		(27)
Heatloss Floor 1			70.3100	0.1000	7.0310	110.0000	7734.1000 (28a)
External Wall GF	89.3700	11.5600	77.8100	0.1600	12.4496	190.0000	14783.9000 (29a)
Total net area of external elements Aum(A, m ²)			159.6800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.6607		(33)
Main dwelling							
Party Ceiling 1			70.3100			30.0000	2109.3000 (32b)
Internal Wall 1			127.9500			75.0000	9596.2500 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	34223.5500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							486.8215 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E5 Ground floor (normal)				36.1100	0.0560	2.0222	
E6 Intermediate floor within a dwelling				36.1100	0.0050	0.1805	

elmhurst
energy

6. Solar gains												
[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
North					1.5600	10.6334	0.4000	1.0000			0.7700	4.5982 (74)
East					3.1200	19.6403	0.4000	1.0000			0.7700	16.9862 (76)
South					6.8800	46.7521	0.4000	1.0000			0.7700	89.1625 (78)
Solar gains	110.7469	188.0412	255.6649	314.0264	349.1940	345.5436	333.6097	307.5499	275.9075	207.3907	132.5403	94.8465 (83)
Total gains	606.7156	694.4546	741.7511	782.6663	794.6176	771.9751	744.1409	719.1950	699.7740	648.8791	600.6204	580.8321 (84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	174.5711	175.2655	175.9655	179.5507	180.2853	184.0506	184.0506	184.8226	182.5258	180.2853	178.8220	177.3822	21.0000 (85)
alpha	12.6381	12.6844	12.7310	12.9700	13.0190	13.2700	13.2700	13.3215	13.1684	13.0190	12.9215	12.8255	
util living area	0.9980	0.9883	0.9497	0.8068	0.6167	0.4282	0.3054	0.3290	0.5135	0.8290	0.9864	0.9987	(86)
MIT	20.7242	20.8303	20.9284	20.9916	20.9997	21.0000	21.0000	21.0000	21.0000	20.9905	20.8668	20.7090	(87)
Th 2	20.6127	20.6142	20.6158	20.6234	20.6250	20.6326	20.6326	20.6342	20.6296	20.6250	20.6219	20.6188	(88)
util rest of house													
	0.9974	0.9853	0.9393	0.7846	0.5920	0.4036	0.2799	0.3028	0.4860	0.8036	0.9824	0.9983	(89)
MIT 2	20.3557	20.4617	20.5560	20.6174	20.6248	20.6326	20.6326	20.6342	20.6296	20.6184	20.5048	20.3462	(90)
Living area fraction													
MIT	20.4854	20.5913	20.6870	20.7490	20.7567	20.7619	20.7619	20.7629	20.7599	20.7493	20.6321	20.4738	(91)
Temperature adjustment												0.0000	(92)
adjusted MIT	20.4854	20.5913	20.6870	20.7490	20.7567	20.7619	20.7619	20.7629	20.7599	20.7493	20.6321	20.4738	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9972	0.9851	0.9414	0.7921	0.6007	0.4123	0.2889	0.3120	0.4957	0.8122	0.9825	0.9982	(94)
Useful gains	605.0190	684.1329	698.2638	619.9590	477.3103	318.2698	214.9677	224.4082	346.8504	526.9919	590.1380	579.7727	(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	881.3988	851.1107	766.4509	627.3632	477.5623	318.2713	214.9678	224.4082	346.8674	535.1774	719.3963	872.1711	(97)
Space heating kWh	205.6266	112.2091	50.7313	5.3310	0.1875	0.0000	0.0000	0.0000	0.0000	6.0900	93.0659	217.5444	(98a)
Space heating requirement - total per year (kWh/year)												690.7858	
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	205.6266	112.2091	50.7313	5.3310	0.1875	0.0000	0.0000	0.0000	0.0000	6.0900	93.0659	217.5444	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												690.7858	
Space heating per m2										(98c) / (4) =		9.8263	(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 %)													88.8000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	205.6266	112.2091	50.7313	5.3310	0.1875	0.0000	0.0000	0.0000	0.0000	6.0900	93.0659	217.5444	(98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000	(210)
Space heating fuel (main heating system)	231.5615	126.3616	57.1298	6.0034	0.2112	0.0000	0.0000	0.0000	0.0000	6.8581	104.8040	244.9825	(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	245.6954	217.2501	230.5701	202.0133	195.3801	175.5562	172.8262	179.9161	182.1568	203.7321	217.4052	242.9051	(64)
Efficiency of water heater (217)m	83.6633	82.6531	81.2858	80.0085	79.8078	79.8000	79.8000	79.8000	79.8000	80.0354	82.3003	79.8000	(216)
Fuel for water heating, kWh/month	293.6716	262.8457	283.6538	252.4898	244.8134	219.9952	216.5741	225.4588	228.2667	254.5524	264.1607	289.8166	(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	20.4554	18.4758	20.4554	19.7955	20.4554	19.7955	20.4554	20.4554	19.7955	20.4554	19.7955	20.4554	(231)
Lighting	21.5029	17.2504	15.5321	11.3795	8.7898	7.1814	8.0184	10.4226	13.5379	17.7625	20.0627	22.1005	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-37.7680	-51.7687	-72.2266	-79.5254	-85.1292	-79.4496	-78.7396	-74.8152	-67.9354	-58.6283	-41.1787	-32.9276	(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	-22.6726	-45.6558	-85.5526	-121.7053	-155.7712	-154.5264	-153.3347	-132.8623	-101.8972	-63.6072	-29.8119	-18.1363	(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												777.9119	(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												3036.2989	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7280)													
mechanical ventilation fans (SFP = 0.7280)												154.8454	(230a)
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												240.8454	(231)
Electricity for lighting (calculated in Appendix L)												173.5408	(232)

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Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	-1845.6258	(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	2382.9712	(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	777.9119	0.2100	163.3615 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3036.2989	0.2100	637.6228 (264)
Space and water heating			800.9843 (265)
Pumps, fans and electric keep-hot	240.8454	0.1387	33.4082 (267)
Energy for lighting	173.5408	0.1443	25.0473 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-760.0923	0.1350	-102.5991
PV Unit electricity exported	-1085.5335	0.1274	-138.2459
Total			-240.8450 (269)
Total CO2, kg/year			618.5948 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			8.8000 (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	777.9119	1.1300	879.0404 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3036.2989	1.1300	3431.0178 (278)
Space and water heating			4310.0582 (279)
Pumps, fans and electric keep-hot	240.8454	1.5128	364.3509 (281)
Energy for lighting	173.5408	1.5338	266.1827 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-760.0923	1.4989	-1139.2954
PV Unit electricity exported	-1085.5335	0.4675	-507.5264
Total			-1646.8218 (283)
Total Primary energy kWh/year			3293.7700 (286)
Dwelling Primary energy Rate (DPER)			46.8500 (287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)

CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

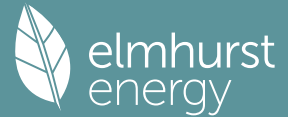
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	70.3000 (1b)	x 2.4800 (2b)	= 174.3440 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	174.3440 (5)

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	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1721 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4221 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.4221 (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	0.5381	0.5276	0.5170	0.4643	0.4537	0.4010	0.4010	0.3904	0.4221	0.4537	0.4748	0.4959 (22b)
Effective ac	0.6448	0.6392	0.6337	0.6078	0.6029	0.5804	0.5804	0.5762	0.5891	0.6029	0.6127	0.6230 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K						
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K						
TER Opening Type			11.5600	1.1450	13.2366			(27)					
Heatloss Floor 1			70.3100	0.1300	9.1403			(28a)					
External Wall GF	89.3700	11.5600	77.8100	0.1800	14.0058			(29a)					
Total net area of external elements Aum(A, m2)			159.6800					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)... (30) + (32) =		36.3827			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							486.8215	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value		Total						
E5 Ground floor (normal)				36.1100	0.1600		5.7776						
E6 Intermediate floor within a dwelling				36.1100	0.0000		0.0000						
E16 Corner (normal)				14.8500	0.0900		1.3365						
E17 Corner (inverted - internal area greater than external area)				4.9500	-0.0900		-0.4455						
E2 Other lintels (including other steel lintels)				8.2000	0.0500		0.4100						
E3 Sill				7.2000	0.0500		0.3600						
E4 Jamb				17.2000	0.0500		0.8600						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.2986	(36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	44.6813	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	37.0976	36.7741	36.4570	34.9676	34.6890	33.3918	33.3918	33.1516	33.8914	34.6890	35.2527	35.8420	(38)
Average = Sum(39)m / 12 =	81.7789	81.4554	81.1383	79.6490	79.3703	78.0731	78.0731	77.8329	78.5728	79.3703	79.9340	80.5234	(39)
												79.6476	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1633	1.1587	1.1542	1.1330	1.1290	1.1106	1.1106	1.1072	1.1177	1.1290	1.1370	1.1454	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

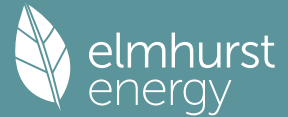
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2534	(42)
Hot water usage for mixer showers	62.0015	61.0698	59.7120	57.1142	55.1970	53.0591	51.8438	53.1913	54.6684	56.9640	59.6176	61.7640	(42a)	
Hot water usage for baths	26.7859	26.3881	25.8279	24.7950	24.0216	23.1640	22.7007	23.2570	23.8627	24.7804	25.8345	26.6954	(42b)	
Hot water usage for other uses	37.7069	36.3358	34.9646	33.5934	32.2223	30.8511	30.8511	32.2223	33.5934	34.9646	36.3358	37.7069	(42c)	
Average daily hot water use (litres/day)													116.2771	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use	126.4944	123.7936	120.5045	115.5026	111.4409	107.0742	105.3957	108.6706	112.1246	116.7089	121.7879	126.1663	(44)	
Energy content (annual)	200.3362	176.2805	185.2109	158.1173	150.0209	131.6602	127.4670	134.5569	138.2608	158.3729	173.5092	197.5459	(45)	
Distribution loss (46)m = 0.15 x (45)m	30.0504	26.4421	27.7816	23.7176	22.5031	19.7490	19.1200	20.1835	20.7391	23.7559	26.0264	29.6319	(46)	
Water storage loss (or HIU 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														
WWHRS	246.9311	218.3662	231.8058	203.2092	196.6158	176.7520	174.0619	181.1518	183.3526	204.9678	218.6010	244.1408	(62)	
PV diverter	-28.3445	-25.0681	-26.2499	-21.7359	-20.2571	-17.3342	-16.2480	-17.2781	-17.9346	-21.1429	-23.9523	-27.8196	(63a)	
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	(63b)	
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	(63c)	
Output from w/h	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)	
	218.5865	193.2981	205.5560	181.4732	176.3587	159.4179	157.8139	163.8737	165.4181	183.8249	194.6487	216.3212	(64)	
12Total per year (kWh/year)													2216.5907	(64)
Electric shower(s)													2217	(64)
	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)	
													0.0000	(64a)
Heat gains from water heating, kWh/month														
	103.8877	92.2818	98.8586	88.6475	87.1579	79.8505	79.6587	82.0161	82.0452	89.9349	93.7653	102.9599	(65)	

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
112.6693	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
103.6371	114.7411	103.6371	107.0916	103.6371	107.0916	103.6371	103.6371	107.0916	103.6371	107.0916	103.6371	103.6371	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
197.9962	200.0508	194.8733	183.8511	169.9375	156.8607	148.1246	146.0700	151.2475	162.2697	176.1833	189.2601	189.2601	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
34.2669	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
-90.1354	-90.1354	-90.1354	-90.1354	-90.1354	-90.1354	-90.1354	-90.1354	-90.1354	-90.1354	-90.1354	-90.1354	-90.1354	(71)
Water heating gains (Table 5)													
139.6340	137.3242	132.8744	123.1215	117.1477	110.9034	107.0681	110.2367	113.9517	120.8803	130.2295	138.3870	138.3870	(72)
Total internal gains													
501.0681	511.9168	491.1856	473.8650	450.5230	431.6566	415.6306	416.7445	429.0916	446.5878	473.3053	491.0850	491.0850	(73)

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6. Solar gains

[Jan]	Area m2		Solar flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
North	1.5600		10.6334		0.6300		0.7000		0.7700		5.0695	(74)
East	3.1200		19.6403		0.6300		0.7000		0.7700		18.7272	(76)
South	6.8800		46.7521		0.6300		0.7000		0.7700		98.3017	(78)
Solar gains	122.0985	207.3155	281.8706	346.2141	384.9864	380.9619	367.8047	339.0737	304.1880	228.6482	146.1256	104.5683 (83)
Total gains	623.1666	719.2323	773.0562	820.0791	835.5095	812.6184	783.4353	755.8183	733.2796	675.2361	619.4309	595.6533 (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	116.2468	116.7085	117.1646	119.3555	119.7745	121.7646	121.7646	122.1404	120.9903	119.7745	118.9298	118.0594
alpha	8.7498	8.7806	8.8110	8.9570	8.9850	9.1176	9.1176	9.1427	9.0660	8.9850	8.9287	8.8706
util living area	0.9994	0.9977	0.9914	0.9561	0.8358	0.6121	0.4383	0.4734	0.7263	0.9654	0.9976	0.9996 (86)
MIT	20.3532	20.4827	20.6426	20.8431	20.9652	20.9980	20.9999	20.9998	20.9916	20.8483	20.5694	20.3393 (87)
Th 2	19.9495	19.9532	19.9568	19.9740	19.9772	19.9922	19.9922	19.9950	19.9864	19.9772	19.9707	19.9639 (88)
util rest of house	0.9991	0.9962	0.9856	0.9291	0.7650	0.5174	0.3380	0.3702	0.6271	0.9378	0.9957	0.9994 (89)
MIT 2	19.2152	19.3835	19.5878	19.8394	19.9572	19.9916	19.9922	19.9950	19.9835	19.8527	19.5091	19.2094 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.6155	19.7701	19.9589	20.1924	20.3118	20.3457	20.3467	20.3485	20.3381	20.2029	19.8821	19.6069 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.6155	19.7701	19.9589	20.1924	20.3118	20.3457	20.3467	20.3485	20.3381	20.2029	19.8821	19.6069 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9989	0.9958	0.9856	0.9359	0.7898	0.5509	0.3733	0.4065	0.6626	0.9452	0.9955	0.9992 (94)
Useful gains	622.4691	716.2077	761.9188	767.4724	659.8660	447.6869	292.4928	307.2712	485.8549	638.2630	616.6147	595.1913 (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	1252.4851	1211.2530	1092.0302	899.4306	683.5231	448.5810	292.5158	307.3199	490.1447	762.1876	1021.7233	1240.6120 (97)
Space heating kWh	468.7319	332.6704	245.6029	95.0099	17.6009	0.0000	0.0000	0.0000	0.0000	92.2000	291.6783	480.1930 (98a)
Space heating requirement - total per year (kWh/year)	2023.6872											
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	468.7319	332.6704	245.6029	95.0099	17.6009	0.0000	0.0000	0.0000	0.0000	92.2000	291.6783	480.1930 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2023.6872											
Space heating per m2	(98c) / (4) = 28.7864 (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	468.7319	332.6704	245.6029	95.0099	17.6009	0.0000	0.0000	0.0000	0.0000	92.2000	291.6783	480.1930 (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)	507.8352	360.4230	266.0919	102.9359	19.0692	0.0000	0.0000	0.0000	0.0000	99.8916	316.0111	520.2525 (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	218.5865	193.2981	205.5560	181.4732	176.3587	159.4179	157.8139	163.8737	165.4181	183.8249	194.6487	216.3212 (64)
Efficiency of water heater (217)m	85.7252	85.2659	84.4600	82.6796	80.5407	79.8000	79.8000	79.8000	79.8000	82.5962	84.9647	79.8000 (216)
Fuel for water heating, kWh/month	254.9851	226.7004	243.3767	219.4898	218.9682	199.7717	197.7617	205.3555	207.2908	222.5585	229.0936	252.1378 (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	21.5337	17.2752	15.5544	11.3958	8.8024	7.1917	8.0299	10.4375	13.5573	17.7880	20.0915	22.1322 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-33.0166	-46.6132	-67.1031	-75.5776	-81.6209	-76.2453	-75.3175	-71.0504	-63.5253	-53.3740	-36.3270	-28.5383 (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	-18.4499	-38.8381	-77.2365	-116.0613	-153.5096	-154.2449	-152.4154	-129.0157	-94.5296	-55.5445	-24.6356	-14.5866 (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)												

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(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												2192.5105	(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												2677.4900	(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)												173.7896	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1737.3768	(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												3392.4133	(238)

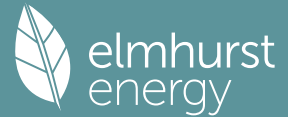
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2192.5105	0.2100	460.4272	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2677.4900	0.2100	562.2729	(264)
Space and water heating			1022.7001	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	173.7896	0.1443	25.0832	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-708.3091	0.1345	-95.3015	
PV Unit electricity exported	-1029.0677	0.1259	-129.5429	
Total			-224.8445	(269)
Total CO2, kg/year			834.8681	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.8800	(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	2192.5105	1.1300	2477.5369	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2677.4900	1.1300	3025.5637	(278)
Space and water heating			5503.1005	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	173.7896	1.5338	266.5643	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-708.3091	1.4973	-1060.5259	
PV Unit electricity exported	-1029.0677	0.4621	-475.5113	
Total			-1536.0372	(283)
Total Primary energy kWh/year			4363.7284	(286)
Target Primary Energy Rate (TPER)			62.0700	(287)

Full SAP Calculation Printout



Plot Reference	3B5P				Issued on Date	30/03/2026	
Assessment Reference	BeLean			Plot Type Ref			
Plot Address	Beaconsfield, Land West of Gatesmead, Haywards Heath, RH161SN				SAP Version	10.2	
SAP Rating	90 B	DER	11.32	TER	12.27		
Environmental	91 B	% DER < TER				7.74	
CO ₂ Emissions (t/year)	0.82	DFEE	35.77	TFEE	41.32		
Compliance Check	See BREL	% DFEE < TFEE				13.44	
% DPER < TPER	4.30	DPER	61.43	TPER	64.19		
Assessor Details	Mr. Mirza Baig				Assessor ID	CK52-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	41.6100 (1b)	x 2.7400 (2b)	= 114.0114 (1b) - (3b)
First floor	41.6100 (1c)	x 2.4600 (2c)	= 102.3606 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 216.3720 (5)

2. Ventilation rate

	m ³ 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)
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	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (22b)
Balanced mechanical ventilation with heat recovery												
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)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.0000 (23c)
Effective ac	0.3312	0.3275	0.3237	0.3050	0.3013	0.2825	0.2825	0.2788	0.2900	0.3013	0.3087	0.3163 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Front Door			2.1000	1.0000	2.1000		(26)
Window			13.2400	1.0536	13.9502		(27)
Heatloss Floor 1			41.6100	0.1000	4.1610	110.0000	4577.1000 (28a)
External Wall GF	95.4400	15.3400	80.1000	0.1600	12.8160	190.0000	15219.0000 (29a)
External Roof 1	41.6100		41.6100	0.1000	4.1610	9.0000	374.4900 (30)
Total net area of external elements Aum(A, m ²)			178.6600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.1882		(33)
Main dwelling							
Party Wall 1			41.6100	0.0000	0.0000	140.0000	5825.4000 (32)
Internal Wall 1			214.5900			75.0000	16094.2500 (32c)
Internal Ceiling 1			41.6100			9.0000	374.4900 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	42464.7300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							510.2707 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	18.3700	0.0560	1.0287
E6 Intermediate floor within a dwelling	18.3700	0.0050	0.0919
E10 Eaves (insulation at ceiling level)	8.4600	0.0500	0.4230
E12 Gable (insulation at ceiling level)	10.1600	0.0570	0.5791
E16 Corner (normal)	10.3900	0.0360	0.3740
E18 Party wall between dwellings	10.3900	0.0390	0.4052
E2 Other lintels (including other steel lintels)	11.4500	0.0620	0.7099
E3 Sill	8.6500	0.0390	0.3374
E4 Jamb	25.1000	0.0520	1.3052
P1 Party wall - Ground floor	8.4600	0.3200	2.7072
P4 Party wall - Roof (insulation at ceiling level)	8.4600	0.0420	0.3553
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.3169 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	45.5051 (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	23.6522	23.3844	23.1166	21.7778	21.5101	20.1713	20.1713	19.9035	20.7068	21.5101	22.0456	22.5811	(38)
Heat transfer coeff	69.1573	68.8895	68.6217	67.2829	67.0152	65.6764	65.6764	65.4086	66.2119	67.0152	67.5507	68.0862	(39)
Average = Sum(39)m / 12 =												67.2160	
HLP	0.8310	0.8278	0.8246	0.8085	0.8053	0.7892	0.7892	0.7860	0.7956	0.8053	0.8117	0.8181	(40)
HLP (average)												0.8077	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5211 (42)
Hot water usage for mixer showers	66.4907	65.4915	64.0354	61.2495	59.1935	56.9008	55.5976	57.0426	58.6266	61.0884	63.9341	66.2359	(42a)
Hot water usage for baths	28.7164	28.2899	27.6893	26.5820	25.7528	24.8334	24.3368	24.9332	25.5825	26.5663	27.6965	28.6193	(42b)
Hot water usage for other uses	40.4488	38.9780	37.5071	36.0362	34.5654	33.0945	33.0945	34.5654	36.0362	37.5071	38.9780	40.4488	(42c)
Average daily hot water use (litres/day)												124.6985	(43)
Daily hot water use	135.6559	132.7594	129.2318	123.8677	119.5117	114.8287	113.0289	116.5411	120.2454	125.1618	130.6086	135.3041	(44)
Energy conte	214.8458	189.0475	198.6245	169.5687	160.8858	141.1953	136.6986	144.3023	148.2746	169.8434	186.0759	211.8535	(45)
Energy content (annual)										Total = Sum(45)m =		2071.2158	
Distribution loss (46)m = 0.15 x (45)m	32.2269	28.3571	29.7937	25.4353	24.1329	21.1793	20.5048	21.6453	22.2412	25.4765	27.9114	31.7780	(46)
Water storage loss (or HIU loss):													
Store volume												180.0000	(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	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	260.2050	230.0171	243.9837	213.4647	206.2450	185.0913	182.0578	189.6615	192.1706	215.2026	229.9719	257.2127	(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	260.2050	230.0171	243.9837	213.4647	206.2450	185.0913	182.0578	189.6615	192.1706	215.2026	229.9719	257.2127	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2605.2838	(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	107.7236	95.6340	102.3300	91.4984	89.7819	82.0642	81.7396	84.2679	84.4181	92.7603	96.9870	106.7286	(65)

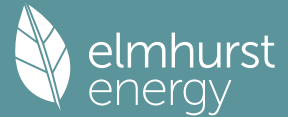
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	126.0562	126.0562	126.0562	126.0562	126.0562	126.0562	126.0562	126.0562	126.0562	126.0562	126.0562	126.0562	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	113.9871	126.2000	113.9871	117.7867	113.9871	117.7867	113.9871	113.9871	117.7867	113.9871	117.7867	113.9871	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	226.0385	228.3840	222.4733	209.8900	194.0058	179.0769	169.1035	166.7579	172.6687	185.2520	201.1362	216.0650	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6056	35.6056	35.6056	35.6056	35.6056	35.6056	35.6056	35.6056	35.6056	35.6056	35.6056	35.6056	(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)	-100.8450	-100.8450	-100.8450	-100.8450	-100.8450	-100.8450	-100.8450	-100.8450	-100.8450	-100.8450	-100.8450	-100.8450	(71)
Water heating gains (Table 5)	144.7898	142.3125	137.5403	127.0811	120.6746	113.9781	109.8651	113.2633	117.2474	124.6778	134.7042	143.4525	(72)
Total internal gains	548.6322	560.7134	537.8176	518.5746	492.4843	471.6585	453.7726	454.8251	468.5196	487.7338	517.4439	537.3215	(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	6.0000	10.6334	0.4000	1.0000	0.7700	17.6855 (74)
East	7.2400	19.6403	0.4000	1.0000	0.7700	39.4166 (76)

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Solar gains	57.1021	110.9050	184.4154	277.4480	351.2361	365.3748	345.4022	288.5461	216.7387	131.7261	70.9651	47.1578 (83)
Total gains	605.7343	671.6185	722.2330	796.0226	843.7204	837.0333	799.1747	743.3713	685.2583	619.4599	588.4091	584.4793 (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	170.5643	171.2272	171.8953	175.3157	176.0162	179.6043	179.6043	180.3395	178.1516	176.0162	174.6208	173.2474
alpha	12.3710	12.4151	12.4597	12.6877	12.7344	12.9736	12.9736	13.0226	12.8768	12.7344	12.6414	12.5498
util living area	0.9998	0.9992	0.9949	0.9369	0.7345	0.5021	0.3616	0.4047	0.6655	0.9691	0.9990	0.9999 (86)
MIT	20.5991	20.6802	20.7981	20.9500	20.9974	21.0000	21.0000	21.0000	20.9994	20.9293	20.7432	20.5912 (87)
Th 2	20.5845	20.5861	20.5877	20.5958	20.5974	20.6054	20.6054	20.6070	20.6022	20.5974	20.5941	20.5909 (88)
util rest of house	0.9998	0.9990	0.9932	0.9215	0.7042	0.4712	0.3292	0.3702	0.6277	0.9579	0.9986	0.9999 (89)
MIT 2	20.2045	20.2870	20.4056	20.5567	20.5958	20.6054	20.6054	20.6070	20.6019	20.5413	20.3572	20.2024 (90)
Living area fraction	20.2733	20.3556	20.4740	20.6253	20.6658	20.6742	20.6742	20.6755	20.6712	20.6089	20.4245	0.1744 (91)
MIT	20.2733	20.3556	20.4740	20.6253	20.6658	20.6742	20.6742	20.6755	20.6712	20.6089	20.4245	20.2702 (92)
Temperature adjustment	20.1233	20.2056	20.3240	20.4753	20.5158	20.5242	20.5242	20.5255	20.5212	20.4589	20.2745	-0.1500
adjusted MIT	20.1233	20.2056	20.3240	20.4753	20.5158	20.5242	20.5242	20.5255	20.5212	20.4589	20.2745	20.1202 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9997	0.9987	0.9918	0.9164	0.6980	0.4648	0.3225	0.3630	0.6199	0.9532	0.9982	0.9998 (94)
Useful gains	605.5545	670.7144	716.3146	729.4671	588.8864	389.0696	257.7275	269.8451	424.8139	590.4883	587.3382	584.3634 (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	1094.2988	1054.3920	948.6264	778.8183	590.7949	389.0797	257.7276	269.8454	425.1598	660.6986	889.9488	1083.9465 (97)
Space heating kWh	363.6257	257.8314	172.8400	35.5329	1.4199	0.0000	0.0000	0.0000	0.0000	52.2364	217.8796	371.6898 (98a)
Space heating requirement - total per year (kWh/year)												1473.0558
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	363.6257	257.8314	172.8400	35.5329	1.4199	0.0000	0.0000	0.0000	0.0000	52.2364	217.8796	371.6898 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1473.0558
Space heating per m2										(98c) / (4) =		17.7007 (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 %)												88.8000 (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	363.6257	257.8314	172.8400	35.5329	1.4199	0.0000	0.0000	0.0000	0.0000	52.2364	217.8796	371.6898 (98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (210)
Space heating fuel (main heating system)	409.4884	290.3507	194.6396	40.0145	1.5990	0.0000	0.0000	0.0000	0.0000	58.8248	245.3600	418.5696 (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	260.2050	230.0171	243.9837	213.4647	206.2450	185.0913	182.0578	189.6615	192.1706	215.2026	229.9719	257.2127 (64)
Efficiency of water heater (217)m	84.8103	84.3164	83.3008	80.9711	79.8553	79.8000	79.8000	79.8000	79.8000	81.4116	83.9388	79.8000 (216)
Fuel for water heating, kWh/month	306.8082	272.8024	292.8947	263.6307	258.2732	231.9439	228.1426	237.6710	240.8153	264.3389	273.9756	303.0146 (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	27.0783	24.4578	27.0783	26.2048	27.0783	26.2048	27.0783	27.0783	26.2048	27.0783	26.2048	27.0783 (231)
Lighting	22.0384	17.6800	15.9189	11.6628	9.0087	7.3602	8.2181	10.6821	13.8750	18.2048	20.5623	22.6509 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-25.5791	-36.7210	-53.4716	-61.4248	-67.9232	-64.1409	-63.5799	-59.3575	-52.2787	-42.8208	-28.4858	-22.1017 (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	-10.2375	-21.0120	-40.0272	-57.8230	-74.8326	-74.5116	-73.9456	-63.7106	-48.3628	-29.6151	-13.5827	-8.1584 (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												1658.8466 (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												3174.3112 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:

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(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8820)	
mechanical ventilation fans (SFP = 0.8820)	232.8249 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	318.8249 (231)
Electricity for lighting (calculated in Appendix L)	177.8621 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1093.7042 (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	4236.1406 (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	1658.8466	0.2100	348.3578 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3174.3112	0.2100	666.6053 (264)
Space and water heating			1014.9631 (265)
Pumps, fans and electric keep-hot	318.8249	0.1387	44.2249 (267)
Energy for lighting	177.8621	0.1443	25.6710 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-577.8850	0.1341	-77.4834
PV Unit electricity exported	-515.8192	0.1269	-65.4397
Total			-142.9231 (269)
Total CO2, kg/year			941.9360 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.3200 (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	1658.8466	1.1300	1874.4966 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3174.3112	1.1300	3586.9716 (278)
Space and water heating			5461.4682 (279)
Pumps, fans and electric keep-hot	318.8249	1.5128	482.3183 (281)
Energy for lighting	177.8621	1.5338	272.8109 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-577.8850	1.4955	-864.2326
PV Unit electricity exported	-515.8192	0.4657	-240.2315
Total			-1104.4640 (283)
Total Primary energy kWh/year			5112.1334 (286)
Dwelling Primary energy Rate (DPER)			61.4300 (287)

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

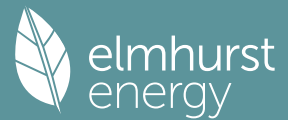
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	41.6100 (1b)	x 2.7400 (2b)	= 114.0114 (1b) - (3b)
First floor	41.6100 (1c)	x 2.4600 (2c)	= 102.3606 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 216.3720 (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	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1387 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3887 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3887 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
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												
	0.4955	0.4858	0.4761	0.4275	0.4178	0.3692	0.3692	0.3595	0.3887	0.4178	0.4372	0.4567 (22b)
Effective ac	0.6228	0.6180	0.6133	0.5914	0.5873	0.5682	0.5682	0.5646	0.5755	0.5873	0.5956	0.6043 (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			2.1000	1.0000	2.1000		(26)
TER Opening Type			13.2400	1.1450	15.1603		(27)
Heatloss Floor 1			41.6100	0.1300	5.4093		(28a)
External Wall GF	95.4400	15.3400	80.1000	0.1800	14.4180		(29a)
External Roof 1	41.6100		41.6100	0.1100	4.5771		(30)
Total net area of external elements Aum (A, m2)			178.6600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.6647		(33)
Main dwelling							
Party Wall 1			41.6100	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							510.2707 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	18.3700	0.1600	2.9392
E6 Intermediate floor within a dwelling	18.3700	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	8.4600	0.0600	0.5076
E12 Gable (insulation at ceiling level)	10.1600	0.0600	0.6096
E16 Corner (normal)	10.3900	0.0900	0.9351
E18 Party wall between dwellings	10.3900	0.0600	0.6234
E2 Other lintels (including other steel lintels)	11.4500	0.0500	0.5725
E3 Sill	8.6500	0.0500	0.4325
E4 Jamb	25.1000	0.0500	1.2550
P1 Party wall - Ground floor	8.4600	0.0800	0.6768
P4 Party wall - Roof (insulation at ceiling level)	8.4600	0.1200	1.0152
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.5669 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 51.2316 (37)

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

(38)m	Jan 44.4678	Feb 44.1274	Mar 43.7937	Apr 42.2265	May 41.9333	Jun 40.5683	Jul 40.5683	Aug 40.3155	Sep 41.0940	Oct 41.9333	Nov 42.5265	Dec 43.1466 (38)
Heat transfer coeff	95.6994	95.3590	95.0253	93.4581	93.1649	91.7999	91.7999	91.5471	92.3256	93.1649	93.7581	94.3782 (39)
Average = Sum(39)m / 12 =												93.4567
HLP	Jan 1.1500	Feb 1.1459	Mar 1.1419	Apr 1.1230	May 1.1195	Jun 1.1031	Jul 1.1031	Aug 1.1001	Sep 1.1094	Oct 1.1195	Nov 1.1266	Dec 1.1341 (40)
HLP (average)												1.1230
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

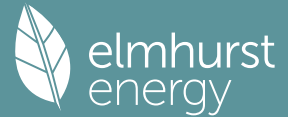
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5211 (42)
Hot water usage for mixer showers												66.2359 (42a)
Hot water usage for baths												28.6193 (42b)
Hot water usage for other uses												40.4488 (42c)
Average daily hot water use (litres/day)												124.6985 (43)
Daily hot water use	Jan 135.6559	Feb 132.7594	Mar 129.2318	Apr 123.8677	May 119.5117	Jun 114.8287	Jul 113.0289	Aug 116.5411	Sep 120.2454	Oct 125.1618	Nov 130.6086	Dec 135.3041 (44)
Energy conte	214.8458	189.0475	198.6245	169.5687	160.8858	141.1953	136.6986	144.3023	148.2746	169.8434	186.0759	211.8535 (45)
Energy content (annual)												Total = Sum(45)m = 2071.2158
Distribution loss (46)m = 0.15 x (45)m												31.7780 (46)
Water storage loss (or HIU loss):												180.0000 (47)
Store volume												1.5520 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.8381 (55)
Enter (49) or (54) in (55)												
Total storage loss	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (56)
If cylinder contains dedicated solar storage	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
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	264.0885	233.5248	247.8672	217.2229	210.1284	188.8495	185.9413	193.5449	195.9288	219.0860	233.7301	261.0962 (62)
WWHRS	-30.3968	-26.8832	-28.1505	-23.3097	-21.7238	-18.5892	-17.4244	-18.5291	-19.2331	-22.6737	-25.6866	-29.8339 (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	233.6917	206.6416	219.7167	193.9132	188.4046	170.2602	168.5168	175.0158	176.6957	196.4123	208.0435	231.2623 (64)
12Total per year (kWh/year)												2368.5745 (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	110.8304	98.4401	105.4368	94.5050	92.8887	85.0708	84.8464	87.3746	87.4247	95.8671	99.9936	109.8354 (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
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(66)m	126.0562	126.0562	126.0562	126.0562	126.0562	126.0562	126.0562	126.0562	126.0562	126.0562	126.0562	126.0562	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.0782	131.8366	119.0782	123.0475	119.0782	123.0475	119.0782	119.0782	123.0475	119.0782	123.0475	119.0782	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	226.0385	228.3840	222.4733	209.8900	194.0058	179.0769	169.1035	166.7579	172.6687	185.2520	201.1362	216.0650	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6056	35.6056	35.6056	35.6056	35.6056	35.6056	35.6056	35.6056	35.6056	35.6056	35.6056	35.6056	(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)	-100.8450	-100.8450	-100.8450	-100.8450	-100.8450	-100.8450	-100.8450	-100.8450	-100.8450	-100.8450	-100.8450	-100.8450	(71)
Water heating gains (Table 5)	148.9656	146.4883	141.7161	131.2569	124.8503	118.1539	114.0409	117.4390	121.4231	128.8536	138.8800	147.6283	(72)
Total internal gains	557.8991	570.5258	547.0845	528.0112	501.7512	481.0951	463.0394	464.0920	477.9562	497.0006	526.8805	546.5884	(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				6.0000	10.6334	0.6300	0.7000		0.7700		19.4982 (74)	
East				7.2400	19.6403	0.6300	0.7000		0.7700		43.4568 (76)	
Solar gains	62.9550	122.2728	203.3179	305.8864	387.2378	402.8257	380.8059	318.1221	238.9544	145.2280	78.2391	51.9914 (83)
Total gains	620.8541	692.7986	750.4024	833.8976	888.9890	883.9208	843.8454	782.2141	716.9106	642.2287	605.1196	598.5798 (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	123.2584	123.6984	124.1328	126.2144	126.6117	128.4943	128.4943	128.8491	127.7625	126.6117	125.8106	124.9839		
alpha	9.2172	9.2466	9.2755	9.4143	9.4408	9.5663	9.5663	9.5899	9.5175	9.4408	9.3874	9.3323		
util living area	0.9999	0.9997	0.9984	0.9844	0.8922	0.6601	0.4784	0.5377	0.8434	0.9930	0.9996	0.9999	(86)	
MIT	20.3094	20.4043	20.5554	20.7804	20.9481	20.9972	20.9999	20.9996	20.9770	20.7653	20.5054	20.3015	(87)	
Th 2	19.9602	19.9636	19.9668	19.9821	19.9849	19.9983	19.9983	20.0008	19.9932	19.9849	19.9791	19.9731	(88)	
util rest of house	0.9998	0.9994	0.9971	0.9717	0.8292	0.5597	0.3697	0.4214	0.7449	0.9850	0.9992	0.9999	(89)	
MIT 2	19.1642	19.2886	19.4845	19.7772	19.9533	19.9975	19.9983	20.0007	19.9840	19.7651	19.4313	19.1647	(90)	
Living area fraction									fLA = Living area / (4) =			0.1744	(91)	
MIT	19.3639	19.4832	19.6712	19.9521	20.1268	20.1718	20.1729	20.1749	20.1571	19.9395	19.6185	19.3629	(92)	
Temperature adjustment												0.0000		
adjusted MIT	19.3639	19.4832	19.6712	19.9521	20.1268	20.1718	20.1729	20.1749	20.1571	19.9395	19.6185	19.3629	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	620.7041	692.2447	747.7761	809.8902	746.0333	510.3379	327.9700	345.5050	546.7469	632.2434	604.5353	598.4777	(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	1441.6068	1390.6358	1251.6008	1032.9064	785.0797	511.4916	327.9938	345.5815	559.2290	870.1092	1173.7144	1431.0518	(97)	
Space heating kWh	610.7516	469.3189	374.8456	160.5717	29.0505	0.0000	0.0000	0.0000	0.0000	176.9722	409.8089	619.4351	(98a)	
Space heating requirement - total per year (kWh/year)												2850.7545		
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	610.7516	469.3189	374.8456	160.5717	29.0505	0.0000	0.0000	0.0000	0.0000	176.9722	409.8089	619.4351	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												2850.7545		
Space heating per m2										(98c) / (4) =		34.2556	(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)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
610.7516	469.3189	374.8456	160.5717	29.0505	0.0000	0.0000	0.0000	0.0000	0.0000	176.9722	409.8089	619.4351	(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)	661.7027	508.4711	406.1166	173.9672	31.4740	0.0000	0.0000	0.0000	0.0000	191.7358	443.9966	671.1107	(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	233.6917	206.6416	219.7167	193.9132	188.4046	170.2602	168.5168	175.0158	176.6957	196.4123	208.0435	231.2623	(64)	
Efficiency of water heater (217)m	86.1123	85.8404	85.2471	83.6398	80.8953	79.8000	79.8000	79.8000	79.8000	83.8268	85.5511	86.1584	(216)	
Fuel for water heating, kWh/month	271.3801	240.7276	257.7410	231.8431	232.8993	213.3587	211.1740	219.3180	221.4231	234.3073	243.1803	268.4153	(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)	

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Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	24.7421	19.8490	17.8719	13.0937	10.1139	8.2632	9.2263	11.9927	15.5773	20.4382	23.0849	(232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-38.6825	-54.4054	-78.0161	-87.4983	-94.1587	-87.8087	-86.7131	-81.9508	-73.5227	-62.0996	-42.4771	(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	(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	(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	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-22.2427	-46.7504	-92.8509	-139.3607	-184.1849	-185.0419	-182.8734	-154.8842	-113.5802	-66.8363	-29.6895	(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	(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	(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	(235d)
Annual totals kWh/year												
Space heating fuel - main system 1											3088.5748	(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											2845.7679	(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)											199.6830	(232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation											-2056.6785	(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											4163.3471	(238)

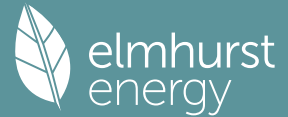
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3088.5748	0.2100	648.6007	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2845.7679	0.2100	597.6112	(264)
Space and water heating			1246.2119	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	199.6830	0.1443	28.8204	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-820.7906	0.1346	-110.5114	
PV Unit electricity exported	-1235.8879	0.1259	-155.6167	
Total			-266.1281	(269)
Total CO2, kg/year			1020.8336	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.2700	(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	3088.5748	1.1300	3490.0895	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2845.7679	1.1300	3215.7177	(278)
Space and water heating			6705.8071	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	199.6830	1.5338	306.2804	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-820.7906	1.4976	-1229.2246	
PV Unit electricity exported	-1235.8879	0.4622	-571.2211	
Total			-1800.4457	(283)
Total Primary energy kWh/year			5341.7427	(286)
Target Primary Energy Rate (TPER)			64.1900	(287)

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Plot Reference	3B6P				Issued on Date	30/03/2026	
Assessment Reference	BeLean			Plot Type Ref			
Plot Address	Harrogate, Land West of Gatesmead, Haywards Heath, RH161SN				SAP Version	10.2	
SAP Rating	92 A	DER	9.27	TER	10.60		
Environmental	91 B	% DER < TER				12.55	
CO ₂ Emissions (t/year)	0.99	DFEE	34.92	TFEE	42.48		
Compliance Check	See BREL	% DFEE < TFEE				17.79	
% DPER < TPER	9.10	DPER	50.42	TPER	55.47		
Assessor Details	Mr. Mirza Baig				Assessor ID	CK52-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	64.0200 (1b)	x 2.7400 (2b)	= 175.4148 (1b) - (3b)
First floor	62.3100 (1c)	x 2.4600 (2c)	= 153.2826 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	126.3300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 328.6974 (5)

2. Ventilation rate

	m ³ 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)											
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	3.0000 (17)											
Infiltration rate	0.1500 (18)											
Number of sides sheltered	0 (19)											
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)											
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (21)											
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (22b)
Balanced mechanical ventilation with heat recovery												
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)											
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.0000 (23c)											
Effective ac	0.3312	0.3275	0.3237	0.3050	0.3013	0.2825	0.2825	0.2788	0.2900	0.3013	0.3087	0.3163 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Front Door			2.1000	1.0000	2.1000		(26)
Window			22.4700	1.0536	23.6753		(27)
Heatloss Floor 1			64.0200	0.1000	6.4020	110.0000	7042.2000 (28a)
External Wall GF	176.7200	24.5700	152.1500	0.1600	24.3440	190.0000	28908.5000 (29a)
External Roof 1	62.3100		62.3100	0.1000	6.2310	9.0000	560.7900 (30)
Flat Roof	1.7000		1.7000	0.1000	0.1700	9.0000	15.3000 (30)
Total net area of external elements Aum(A, m ²)			304.7500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		62.9223		(33)
Main dwelling							
Internal Wall 1			252.8300			75.0000	18962.2500 (32c)
Internal Ceiling 1			62.3100			9.0000	560.7900 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	56049.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							443.6779 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	34.7700	0.0560	1.9471
E6 Intermediate floor within a dwelling	33.1800	0.0050	0.1659
E10 Eaves (insulation at ceiling level)	17.8100	0.0500	0.8905
E12 Gable (insulation at ceiling level)	15.4100	0.0570	0.8784
E16 Corner (normal)	36.6400	0.0360	1.3190
E17 Corner (inverted - internal area greater than external area)	15.8600	-0.0900	-1.4274
E2 Other lintels (including other steel lintels)	17.6500	0.0620	1.0943
E3 Sill	13.9500	0.0390	0.5440
E4 Jamb	25.1000	0.0520	1.3052
E24 Eaves (insulation at ceiling level - inverted)	5.9200	0.0750	0.4440
E14 Flat roof	3.0900	0.0700	0.2163
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			7.3774 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	70.2997 (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	35.9307	35.5240	35.1172	33.0834	32.6766	30.6428	30.6428	30.2361	31.4563	32.6766	33.4902	34.3037	(38)
Heat transfer coeff	106.2304	105.8236	105.4169	103.3831	102.9763	100.9425	100.9425	100.5357	101.7560	102.9763	103.7898	104.6033	(39)
Average = Sum(39)m / 12 =												103.2814	
HLP	0.8409	0.8377	0.8345	0.8184	0.8151	0.7990	0.7990	0.7958	0.8055	0.8151	0.8216	0.8280	(40)
HLP (average)												0.8176	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8848 (42)
Hot water usage for mixer showers	72.5884	71.4976	69.9080	66.8665	64.6221	62.1190	60.6963	62.2739	64.0032	66.6907	69.7974	72.3103	(42a)
Hot water usage for baths	31.3386	30.8732	30.2178	29.0093	28.1044	27.1011	26.5591	27.2099	27.9186	28.9922	30.2255	31.2327	(42b)
Hot water usage for other uses	44.1732	42.5669	40.9606	39.3543	37.7480	36.1417	36.1417	37.7480	39.3543	40.9606	42.5669	44.1732	(42c)
Average daily hot water use (litres/day)												136.1374	(43)
Daily hot water use	148.1003	144.9377	141.0864	135.2302	130.4745	125.3618	123.3971	127.2318	131.2761	136.6435	142.5899	147.7162	(44)
Energy conte	234.5546	206.3893	216.8445	185.1234	175.6438	154.1470	149.2381	157.5396	161.8765	185.4239	203.1454	231.2879	(45)
Energy content (annual)										Total = Sum(45)m =		2261.2140	
Distribution loss (46)m = 0.15 x (45)m	35.1832	30.9584	32.5267	27.7685	26.3466	23.1220	22.3857	23.6309	24.2815	27.8136	30.4718	34.6932	(46)
Water storage loss (or HIU loss):													
Store volume												180.0000	(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	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	279.9138	247.3589	262.2037	229.0194	221.0030	198.0430	194.5973	202.8988	205.7725	230.7831	247.0414	276.6471	(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	279.9138	247.3589	262.2037	229.0194	221.0030	198.0430	194.5973	202.8988	205.7725	230.7831	247.0414	276.6471	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2795.2820	(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	114.2768	101.4001	108.3882	96.6703	94.6889	86.3707	85.9090	88.6693	88.9407	97.9408	102.6627	113.1906	(65)

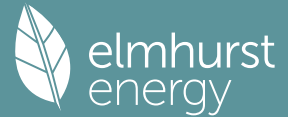
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	144.2399	144.2399	144.2399	144.2399	144.2399	144.2399	144.2399	144.2399	144.2399	144.2399	144.2399	144.2399	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	147.9062	163.7533	147.9062	152.8364	147.9062	152.8364	147.9062	147.9062	152.8364	147.9062	152.8364	147.9062	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	293.2406	296.2835	288.6155	272.2911	251.6845	232.3171	219.3786	216.3357	224.0037	240.3281	260.9347	280.3020	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4240	37.4240	37.4240	37.4240	37.4240	37.4240	37.4240	37.4240	37.4240	37.4240	37.4240	37.4240	(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)	-115.3919	-115.3919	-115.3919	-115.3919	-115.3919	-115.3919	-115.3919	-115.3919	-115.3919	-115.3919	-115.3919	-115.3919	(71)
Water heating gains (Table 5)	153.5978	150.8930	145.6830	134.2643	127.2700	119.9593	115.4691	119.1791	123.5288	131.6409	142.5870	152.1379	(72)
Total internal gains	664.0166	680.2018	651.4766	628.6638	596.1327	571.3848	549.0259	549.6930	566.6409	589.1472	625.6301	649.6181	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	2.8000	10.6334	0.4000	1.0000	0.7700	8.2532 (74)
South	11.1600	46.7521	0.4000	1.0000	0.7700	144.6299 (78)

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West	8.5100		19.6403		0.4000		1.0000		0.7700		46.3308 (80)	
Solar gains	199.2140	343.2718	477.7866	601.7513	680.1335	677.1662	652.1032	593.8190	521.0070	381.8013	239.3863	169.9541 (83)
Total gains	863.2306	1023.4737	1129.2632	1230.4151	1276.2662	1248.5510	1201.1291	1143.5120	1087.6479	970.9485	865.0165	819.5722 (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	146.5625	147.1259	147.6936	150.5991	151.1940	154.2403	154.2403	154.8643	153.0072	151.1940	150.0089	148.8422	
alpha	10.7708	10.8084	10.8462	11.0399	11.0796	11.2827	11.2827	11.3243	11.2005	11.0796	11.0006	10.9228	
util living area	0.9998	0.9984	0.9899	0.9243	0.7424	0.5173	0.3698	0.4044	0.6438	0.9546	0.9986	0.9999 (86)	
MIT	20.5032	20.6280	20.7759	20.9379	20.9944	20.9999	21.0000	21.0000	20.9990	20.9212	20.6836	20.4878 (87)	
Th 2	20.5796	20.5812	20.5828	20.5908	20.5924	20.6005	20.6005	20.6021	20.5973	20.5924	20.5892	20.5860 (88)	
util rest of house	0.9997	0.9979	0.9872	0.9085	0.7123	0.4851	0.3362	0.3694	0.6070	0.9412	0.9981	0.9998 (89)	
MIT 2	20.1071	20.2331	20.3810	20.5412	20.5888	20.6004	20.6005	20.6021	20.5967	20.5295	20.2959	20.0974 (90)	
Living area fraction	fLA = Living area / (4) =												0.2145 (91)
MIT	20.1921	20.3178	20.4657	20.6263	20.6758	20.6861	20.6862	20.6874	20.6830	20.6135	20.3791	20.1812 (92)	
Temperature adjustment													0.0000
adjusted MIT	20.1921	20.3178	20.4657	20.6263	20.6758	20.6861	20.6862	20.6874	20.6830	20.6135	20.3791	20.1812 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9996	0.9976	0.9863	0.9100	0.7185	0.4920	0.3434	0.3769	0.6148	0.9420	0.9978	0.9998 (94)
Useful gains	862.9232	1020.9951	1113.7750	1119.6472	917.0054	614.2440	412.4680	431.0373	668.7291	914.5900	863.0924	819.3985 (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	1688.2231	1631.5682	1472.2208	1212.2988	924.2947	614.3485	412.4695	431.0415	669.8612	1031.1521	1378.2322	1671.6854 (97)
Space heating kWh	614.0231	410.3051	266.6837	66.7091	5.4232	0.0000	0.0000	0.0000	0.0000	86.7222	370.9007	634.1014 (98a)
Space heating requirement - total per year (kWh/year)												2454.8686
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	614.0231	410.3051	266.6837	66.7091	5.4232	0.0000	0.0000	0.0000	0.0000	86.7222	370.9007	634.1014 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2454.8686
Space heating per m2												(98c) / (4) = 19.4322 (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 %)												88.8000 (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	614.0231	410.3051	266.6837	66.7091	5.4232	0.0000	0.0000	0.0000	0.0000	86.7222	370.9007	634.1014 (98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (210)
Space heating fuel (main heating system)	691.4675	462.0553	300.3195	75.1229	6.1073	0.0000	0.0000	0.0000	0.0000	97.6601	417.6810	714.0782 (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	279.9138	247.3589	262.2037	229.0194	221.0030	198.0430	194.5973	202.8988	205.7725	230.7831	247.0414	276.6471 (64)
Efficiency of water heater (217)m	85.7710	85.1865	84.0978	81.6671	79.9942	79.8000	79.8000	79.8000	79.8000	82.0720	84.9689	79.8000 (216)
Fuel for water heating, kWh/month	326.3501	290.3735	311.7842	280.4304	276.2738	248.1742	243.8563	254.2591	257.8603	281.1960	290.7433	322.2123 (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	37.3437	33.7298	37.3437	36.1390	37.3437	36.1390	37.3437	37.3437	36.1390	37.3437	36.1390	37.3437 (231)
Lighting	32.3447	25.9482	23.3634	17.1171	13.2217	10.8022	12.0613	15.6777	20.3638	26.7184	30.1784	33.2437 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-38.0464	-54.0617	-77.9632	-88.6870	-97.3213	-91.6369	-90.8388	-85.1758	-75.5693	-62.6395	-42.1756	-32.9400 (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	-16.7978	-34.3420	-65.2069	-93.9113	-121.2735	-120.6747	-119.7472	-103.2723	-78.5380	-48.2779	-22.2418	-13.3957 (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												2764.4917 (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												3383.5136 (219)
Space cooling fuel												0.0000 (221)

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Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8820)		
mechanical ventilation fans (SFP = 0.8820)		353.6916 (230a)
central heating pump		41.0000 (230c)
main heating flue fan		45.0000 (230e)
Total electricity for the above, kWh/year		439.6916 (231)
Electricity for lighting (calculated in Appendix L)		261.0406 (232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation		-1674.7345 (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		5174.0029 (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	2764.4917	0.2100	580.5433 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3383.5136	0.2100	710.5378 (264)
Space and water heating			1291.0811 (265)
Pumps, fans and electric keep-hot	439.6916	0.1387	60.9906 (267)
Energy for lighting	261.0406	0.1443	37.6762 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-837.0555	0.1343	-112.4038
PV Unit electricity exported	-837.6790	0.1270	-106.3532
Total			-218.7570 (269)
Total CO2, kg/year			1170.9909 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			9.2700 (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	2764.4917	1.1300	3123.8756 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3383.5136	1.1300	3823.3703 (278)
Space and water heating			6947.2459 (279)
Pumps, fans and electric keep-hot	439.6916	1.5128	665.1654 (281)
Energy for lighting	261.0406	1.5338	400.3928 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-837.0555	1.4963	-1252.4647
PV Unit electricity exported	-837.6790	0.4661	-390.4294
Total			-1642.8941 (283)
Total Primary energy kWh/year			6369.9100 (286)
Dwelling Primary energy Rate (DPER)			50.4200 (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	64.0200 (1b)	x 2.7400 (2b)	= 175.4148 (1b) - (3b)
First floor	62.3100 (1c)	x 2.4600 (2c)	= 153.2826 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	126.3300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	328.6974 (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	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1217 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3717 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3717 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000	(22)
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													
Effective ac	0.4739	0.4646	0.4553	0.4089	0.3996	0.3531	0.3531	0.3438	0.3717	0.3996	0.4182	0.4367	(22b)
	0.6123	0.6079	0.6037	0.5836	0.5798	0.5623	0.5623	0.5591	0.5691	0.5798	0.5874	0.5954	(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			2.1000	1.0000	2.1000		(26)
TER Opening Type			22.4700	1.1450	25.7290		(27)
Heatloss Floor 1			64.0200	0.1300	8.3226		(28a)
External Wall GF	176.7200	24.5700	152.1500	0.1800	27.3870		(29a)
External Roof 1	62.3100		62.3100	0.1100	6.8541		(30)
Flat Roof	1.7000		1.7000	0.1100	0.1870		(30)
Total net area of external elements Aum(A, m2)			304.7500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	70.5797	(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K

443.6779 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	34.7700	0.1600	5.5632
E6 Intermediate floor within a dwelling	33.1800	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	17.8100	0.0600	1.0686
E12 Gable (insulation at ceiling level)	15.4100	0.0600	0.9246
E16 Corner (normal)	36.6400	0.0900	3.2976
E17 Corner (inverted - internal area greater than external area)	15.8600	-0.0900	-1.4274
E2 Other lintels (including other steel lintels)	17.6500	0.0500	0.8825
E3 Sill	13.9500	0.0500	0.6975
E4 Jamb	25.1000	0.0500	1.2550
E24 Eaves (insulation at ceiling level - inverted)	5.9200	0.2400	1.4208
E14 Flat roof	3.0900	0.0800	0.2472

Thermal bridges (Sum(L x Psi) calculated using Appendix K)

13.9296 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 84.5093 (37)

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

(38)m	Jan 66.4157	Feb 65.9427	Mar 65.4790	Apr 63.3014	May 62.8940	Jun 60.9974	Jul 60.9974	Aug 60.6462	Sep 61.7279	Oct 62.8940	Nov 63.7182	Dec 64.5799	(38)
Heat transfer coeff	150.9250	150.4520	149.9884	147.8107	147.4033	145.5067	145.5067	145.1555	146.2372	147.4033	148.2275	149.0892	(39)
Average = Sum(39)m / 12 =												147.8088	

HLP	Jan 1.1947	Feb 1.1909	Mar 1.1873	Apr 1.1700	May 1.1668	Jun 1.1518	Jul 1.1518	Aug 1.1490	Sep 1.1576	Oct 1.1668	Nov 1.1733	Dec 1.1802	(40)
HLP (average)												1.1700	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

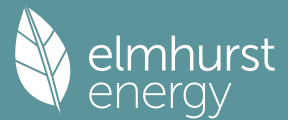
Assumed occupancy												2.8848	(42)
Hot water usage for mixer showers													
72.5884	71.4976	69.9080	66.8665	64.6221	62.1190	60.6963	62.2739	64.0032	66.6907	69.7974	72.3103	(42a)	
Hot water usage for baths													
31.3386	30.8732	30.2178	29.0093	28.1044	27.1011	26.5591	27.2099	27.9186	28.9922	30.2255	31.2327	(42b)	
Hot water usage for other uses													
44.1732	42.5669	40.9606	39.3543	37.7480	36.1417	36.1417	37.7480	39.3543	40.9606	42.5669	44.1732	(42c)	
Average daily hot water use (litres/day)												136.1374	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	148.1003	144.9377	141.0864	135.2302	130.4745	125.3618	123.3971	127.2318	131.2761	136.6435	142.5899	147.7162	(44)
Energy content (annual)	234.5546	206.3893	216.8445	185.1234	175.6438	154.1470	149.2381	157.5396	161.8765	185.4239	203.1454	231.2879	(45)
Distribution loss (46)m = 0.15 x (45)m	35.1832	30.9584	32.5267	27.7685	26.3466	23.1220	22.3857	23.6309	24.2815	27.8136	30.4718	34.6932	(46)
Water storage loss (or HIU loss):													
Store volume													180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.5520 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8381 (55)
Total storage loss	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(56)
If cylinder contains dedicated solar storage	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
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	283.7973	250.8666	266.0872	232.7776	224.8865	201.8012	198.4808	206.7822	209.5307	234.6666	250.7996	280.5305	(62)
WWHRS	-33.1844	-29.3486	-30.7321	-25.4474	-23.7161	-20.2940	-19.0224	-20.2284	-20.9970	-24.7531	-28.0423	-32.5699	(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	250.6129	221.5180	235.3550	207.3302	201.1704	181.5072	179.4584	186.5538	188.5337	209.9135	222.7574	247.9607	(64)
12Total per year (kWh/year)												2532.6712	(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)
												0.0000	(64a)
Heat gains from water heating, kWh/month	117.3835	104.2062	111.4949	99.6769	97.7957	89.3772	89.0158	91.7760	91.9473	101.0476	105.6692	116.2974	(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
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(66)m	144.2399	144.2399	144.2399	144.2399	144.2399	144.2399	144.2399	144.2399	144.2399	144.2399	144.2399	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	151.3570	167.5738	151.3570	156.4022	151.3570	156.4022	151.3570	151.3570	156.4022	151.3570	156.4022	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	293.2406	296.2835	288.6155	272.2911	251.6845	232.3171	219.3786	216.3357	224.0037	240.3281	260.9347	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4240	37.4240	37.4240	37.4240	37.4240	37.4240	37.4240	37.4240	37.4240	37.4240	37.4240	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)	-115.3919	-115.3919	-115.3919	-115.3919	-115.3919	-115.3919	-115.3919	-115.3919	-115.3919	-115.3919	-115.3919	(71)
Water heating gains (Table 5)	157.7736	155.0688	149.8588	138.4401	131.4458	124.1350	119.6449	123.3549	127.7046	135.8167	146.7628	(72)
Total internal gains	671.6432	688.1981	659.1032	636.4054	603.7593	579.1264	556.6525	557.3196	574.3825	596.7738	633.3718	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
North					2.8000	10.6334		0.6300	0.7000	0.7700		9.0992 (74)	
South					11.1600	46.7521		0.6300	0.7000	0.7700		159.4545 (78)	
West					8.5100	19.6403		0.6300	0.7000	0.7700		51.0797 (80)	
Solar gains	219.6334	378.4572	526.7597	663.4308	749.8472	746.5757	718.9438	654.6854	574.4102	420.9360	263.9234	187.3744	(83)
Total gains	891.2766	1066.6553	1185.8629	1299.8362	1353.6065	1325.7021	1275.5963	1212.0050	1148.7927	1017.7097	897.2952	844.6191	(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)														
tau	103.1599	103.4842	103.8040	105.3333	105.6245	107.0012	107.0012	107.2602	106.4667	105.6245	105.0371	104.4301		
alpha	7.8773	7.8989	7.9203	8.0222	8.0416	8.1334	8.1334	8.1507	8.0978	8.0416	8.0025	7.9620		
util living area	0.9998	0.9991	0.9963	0.9776	0.8949	0.6901	0.5010	0.5490	0.8244	0.9872	0.9993	0.9999	(86)	
MIT	20.1469	20.2894	20.4794	20.7281	20.9163	20.9914	20.9994	20.9988	20.9674	20.7225	20.3892	20.1293	(87)	
Th 2	19.9243	19.9273	19.9302	19.9440	19.9466	19.9588	19.9588	19.9610	19.9541	19.9466	19.9414	19.9359	(88)	
util rest of house	0.9997	0.9986	0.9938	0.9624	0.8360	0.5849	0.3830	0.4262	0.7264	0.9755	0.9987	0.9998	(89)	
MIT 2	18.9385	19.1235	19.3681	19.6871	19.8901	19.9558	19.9587	19.9608	19.9395	19.6872	19.2630	18.9254	(90)	
Living area fraction	19.1978	19.3736	19.6065	19.9104	20.1102	20.1780	20.1819	20.1835	20.1600	19.9093	19.5046	19.1836	(92)	
MIT	19.1978	19.3736	19.6065	19.9104	20.1102	20.1780	20.1819	20.1835	20.1600	19.9093	19.5046	19.1836	(93)	
Temperature adjustment												0.0000		
adjusted MIT	19.1978	19.3736	19.6065	19.9104	20.1102	20.1780	20.1819	20.1835	20.1600	19.9093	19.5046	19.1836		

8. Space heating requirement

Utilisation	0.9996	0.9982	0.9927	0.9618	0.8465	0.6078	0.4084	0.4527	0.7476	0.9750	0.9984	0.9997	(94)	
Useful gains	890.9091	1064.7135	1177.1773	1250.1888	1145.8655	805.7493	520.9811	548.7172	858.8506	992.2318	895.8177	844.3914	(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	2248.4427	2177.5860	1965.8200	1627.4541	1239.6917	811.6346	521.1937	549.1914	886.1960	1372.2225	1838.6977	2233.8965	(97)	
Space heating kWh	1010.0050	747.8503	586.7501	271.6310	69.8067	0.0000	0.0000	0.0000	0.0000	282.7131	678.8736	1033.7918	(98a)	
Space heating requirement - total per year (kWh/year)												4681.4216		
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	1010.0050	747.8503	586.7501	271.6310	69.8067	0.0000	0.0000	0.0000	0.0000	282.7131	678.8736	1033.7918	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												4681.4216		
Space heating per m2										(98c) / (4) =		37.0571	(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)
Space heating requirement	1010.0050	747.8503	586.7501	271.6310	69.8067	0.0000	0.0000	0.0000	0.0000	282.7131	678.8736	1033.7918	(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)	1094.2633	810.2387	635.6989	294.2914	75.6302	0.0000	0.0000	0.0000	0.0000	306.2980	735.5077	1120.0345	(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	250.6129	221.5180	235.3550	207.3302	201.1704	181.5072	179.4584	186.5538	188.5337	209.9135	222.7574	247.9607	(64)	
Efficiency of water heater (217)m	86.8527	86.5689	86.0225	84.6665	81.9394	79.8000	79.8000	79.8000	79.8000	84.7282	86.3928	86.9039	(216)	
Fuel for water heating, kWh/month	288.5495	255.8864	273.5970	244.8785	245.5113	227.4526	224.8852	233.7767	236.2578	247.7494	257.8427	285.3274	(219)	
Space cooling fuel requirement														

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(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	31.4490	25.2296	22.7164	16.6430	12.8555	10.5031	11.7273	15.2435	19.7998	25.9785	29.3426	32.3231	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-56.8330	-78.6027	-110.8382	-122.1327	-129.5682	-120.0927	-118.5011	-112.8349	-102.6277	-88.5904	-61.8945	-49.3067	(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	-36.9049	-77.0328	-152.0529	-226.9063	-298.6836	-299.7077	-296.2773	-251.5529	-185.2436	-109.7868	-49.1389	-29.2381	(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												5071.9627	(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												3021.7144	(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)												253.8114	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3164.3489	(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												5269.1396	(238)

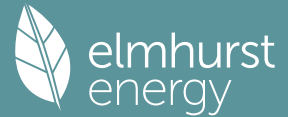
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	5071.9627	0.2100	1065.1122 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3021.7144	0.2100	634.5600 (264)
Space and water heating			1699.6722 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	253.8114	0.1443	36.6328 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1151.8230	0.1350	-155.5207
PV Unit electricity exported	-2012.5259	0.1261	-253.7384
Total			-409.2591 (269)
Total CO2, kg/year			1338.9752 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.6000 (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	5071.9627	1.1300	5731.3179 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3021.7144	1.1300	3414.5373 (278)
Space and water heating			9145.8552 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	253.8114	1.5338	389.3044 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1151.8230	1.4990	-1726.6290
PV Unit electricity exported	-2012.5259	0.4628	-931.4100
Total			-2658.0390 (283)
Total Primary energy kWh/year			7007.2213 (286)
Target Primary Energy Rate (TPER)			55.4700 (287)

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Plot Reference	4B6P	Issued on Date	30/03/2026
Assessment Reference	BeLean	Plot Type Ref	
Plot Address	Trent, Land West of Gatesmead, Haywards Heath, RH161SN	SAP Version	10.2
SAP Rating	92 A	DER	9.28
Environmental	92 A	% DER < TER	8.84
CO ₂ Emissions (t/year)	0.85	DFEE	31.72
Compliance Check	See BREL	% DFEE < TFEE	13.57
% DPER < TPER	5.02	DPER	50.46
Assessor Details	Mr. Mirza Baig	Assessor ID	CK52-0001
Client			

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	53.1800 (1b)	x 2.7400 (2b)	= 145.7132 (1b) - (3b)
First floor	53.1800 (1c)	x 2.4600 (2c)	= 130.8228 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	106.3600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 276.5360 (5)

2. Ventilation rate

	m ³ 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)
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	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (22b)
Balanced mechanical ventilation with heat recovery												
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)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.0000 (23c)
Effective ac	0.3312	0.3275	0.3237	0.3050	0.3013	0.2825	0.2825	0.2788	0.2900	0.3013	0.3087	0.3163 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Front Door			2.1000	1.0000	2.1000		(26)
Window			13.8400	1.0536	14.5824		(27)
Heatloss Floor 1			53.1800	0.1000	5.3180	110.0000	5849.8000 (28a)
External Wall GF	109.2500	15.9400	93.3100	0.1600	14.9296	190.0000	17728.9000 (29a)
External Roof 1	53.1800		53.1800	0.1000	5.3180	9.0000	478.6200 (30)
Total net area of external elements Aum(A, m ²)			215.6100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		42.2480		(33)
Main dwelling							
Party Wall 1			43.9400	0.0000	0.0000	140.0000	6151.6000 (32)
Internal Wall 1			259.5800			75.0000	19468.5000 (32c)
Internal Ceiling 1			53.1800			9.0000	478.6200 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	50156.0400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							471.5686 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	21.0300	0.0560	1.1777
E6 Intermediate floor within a dwelling	21.0300	0.0050	0.1052
E10 Eaves (insulation at ceiling level)	8.4600	0.0500	0.4230
E12 Gable (insulation at ceiling level)	12.6000	0.0570	0.7182
E16 Corner (normal)	10.3900	0.0360	0.3740
E18 Party wall between dwellings	10.3900	0.0390	0.4052
E2 Other lintels (including other steel lintels)	11.4000	0.0620	0.7068
E3 Sill	8.6000	0.0390	0.3354
E4 Jamb	22.4000	0.0520	1.1648
P1 Party wall - Ground floor	8.4600	0.3200	2.7072
P4 Party wall - Roof (insulation at ceiling level)	8.4600	0.0420	0.3553
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.4728 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	50.7208 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	30.2288	29.8866	29.5444	27.8333	27.4911	25.7801	25.7801	25.4379	26.4645	27.4911	28.1756	28.8600	(38)
Heat transfer coeff	80.9496	80.6074	80.2652	78.5541	78.2119	76.5008	76.5008	76.1586	77.1853	78.2119	78.8963	79.5808	(39)
Average = Sum(39)m / 12 =												78.4686	
HLP	0.7611	0.7579	0.7547	0.7386	0.7354	0.7193	0.7193	0.7160	0.7257	0.7354	0.7418	0.7482	(40)
HLP (average)												0.7378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7911 (42)
Hot water usage for mixer showers	71.0177	69.9504	68.3952	65.4196	63.2237	60.7748	59.3829	60.9263	62.6182	65.2476	68.2871	70.7456	(42a)
Hot water usage for baths	30.6632	30.2078	29.5665	28.3841	27.4987	26.5169	25.9866	26.6234	27.3168	28.3673	29.5741	30.5595	(42b)
Hot water usage for other uses	43.2139	41.6424	40.0710	38.4996	36.9282	35.3568	35.3568	36.9282	38.4996	40.0710	41.6424	43.2139	(42c)
Average daily hot water use (litres/day)												133.1908	(43)
Daily hot water use	144.8947	141.8006	138.0327	132.3033	127.6506	122.6486	120.7263	124.4780	128.4347	133.6859	139.5036	144.5189	(44)
Energy conte	229.4778	201.9222	212.1512	181.1166	171.8422	150.8107	146.0081	154.1298	158.3728	181.4105	198.7485	226.2817	(45)
Energy content (annual)										Total = Sum(45)m =		2212.2721	
Distribution loss (46)m = 0.15 x (45)m	34.4217	30.2883	31.8227	27.1675	25.7763	22.6216	21.9012	23.1195	23.7559	27.2116	29.8123	33.9423	(46)
Water storage loss (or HIU loss):													
Store volume												180.0000	(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	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	274.8370	242.8918	257.5104	225.0126	217.2014	194.7067	191.3673	199.4890	202.2688	226.7697	242.6445	271.6409	(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	274.8370	242.8918	257.5104	225.0126	217.2014	194.7067	191.3673	199.4890	202.2688	226.7697	242.6445	271.6409	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2746.3401	(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	112.5887	99.9148	106.8276	95.3381	93.4249	85.2614	84.8350	87.5355	87.7757	96.6064	101.2007	111.5260	(65)

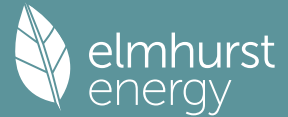
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	139.5560	139.5560	139.5560	139.5560	139.5560	139.5560	139.5560	139.5560	139.5560	139.5560	139.5560	139.5560	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	136.4721	151.0941	136.4721	141.0212	136.4721	141.0212	136.4721	136.4721	141.0212	136.4721	141.0212	136.4721	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	266.2188	268.9813	262.0199	247.1997	228.4920	210.9094	199.1631	196.4006	203.3620	218.1821	236.8899	254.4725	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.9556	36.9556	36.9556	36.9556	36.9556	36.9556	36.9556	36.9556	36.9556	36.9556	36.9556	36.9556	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-111.6448	-111.6448	-111.6448	-111.6448	-111.6448	-111.6448	-111.6448	-111.6448	-111.6448	-111.6448	-111.6448	-111.6448	(71)
Water heating gains (Table 5)	151.3289	148.6828	143.5855	132.4140	125.5711	118.4186	114.0256	117.6552	121.9108	129.8473	140.5565	149.9006	(72)
Total internal gains	621.8866	636.6250	609.9443	588.5017	558.4020	535.2159	514.5276	515.3947	531.1608	552.3683	586.3343	608.7120	(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
South	5.6900	46.7521	0.4000	1.0000	0.7700	73.7405 (78)
West	8.1500	19.6403	0.4000	1.0000	0.7700	44.3709 (80)

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Solar gains	118.1114	207.5669	296.7824	382.3465	436.6793	435.9099	419.3666	379.3366	326.9523	233.2538	142.7330	100.2071 (83)
Total gains	739.9981	844.1919	906.7267	970.8482	995.0813	971.1258	933.8942	894.7313	858.1131	785.6221	729.0673	708.9191 (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	172.1099	172.8406	173.5775	177.3584	178.1344	182.1187	182.1187	182.9370	180.5038	178.1344	176.5891	175.0704
alpha	12.4740	12.5227	12.5718	12.8239	12.8756	13.1412	13.1412	13.1958	13.0336	12.8756	12.7726	12.6714
util living area	0.9998	0.9984	0.9901	0.9174	0.7274	0.5041	0.3604	0.3915	0.6202	0.9429	0.9982	0.9998 (86)
MIT	20.6215	20.7186	20.8353	20.9629	20.9978	21.0000	21.0000	21.0000	20.9997	20.9550	20.7714	20.6110 (87)
Th 2	20.6195	20.6211	20.6227	20.6307	20.6323	20.6404	20.6404	20.6420	20.6372	20.6323	20.6291	20.6259 (88)
util rest of house	0.9997	0.9979	0.9873	0.9011	0.6999	0.4758	0.3310	0.3611	0.5878	0.9274	0.9976	0.9998 (89)
MIT 2	20.2600	20.3583	20.4752	20.6018	20.6310	20.6404	20.6404	20.6420	20.6370	20.5975	20.4183	20.2553 (90)
Living area fraction	20.3293	20.4274	20.5443	20.6710	20.7013	20.7093	20.7093	20.7106	20.7066	20.6661	20.4860	20.3235 (92)
MIT	20.3293	20.4274	20.5443	20.6710	20.7013	20.7093	20.7093	20.7106	20.7066	20.6661	20.4860	20.3235 (93)
Temperature adjustment												0.0000
adjusted MIT	20.3293	20.4274	20.5443	20.6710	20.7013	20.7093	20.7093	20.7106	20.7066	20.6661	20.4860	20.3235 (93)

8. Space heating requirement

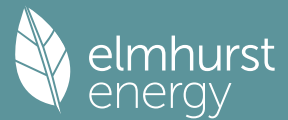
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9996	0.9976	0.9866	0.9030	0.7051	0.4812	0.3366	0.3669	0.5940	0.9289	0.9973	0.9998 (94)
Useful gains	739.7095	842.1996	894.6065	876.6364	701.5987	467.3531	314.3683	328.2925	509.6974	729.7721	727.0690	708.7467 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1297.5677	1251.6218	1127.2644	924.6635	704.0106	467.3693	314.3684	328.2929	509.9318	787.2881	1056.1094	1283.1224 (97)
Space heating kWh	415.0465	275.1318	173.0975	34.5795	1.7945	0.0000	0.0000	0.0000	0.0000	42.7919	236.9091	427.3355 (98a)
Space heating requirement - total per year (kWh/year)												1606.6862
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	415.0465	275.1318	173.0975	34.5795	1.7945	0.0000	0.0000	0.0000	0.0000	42.7919	236.9091	427.3355 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1606.6862
Space heating per m2										(98c) / (4) =		15.1061 (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 %)												88.8000 (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	415.0465	275.1318	173.0975	34.5795	1.7945	0.0000	0.0000	0.0000	0.0000	42.7919	236.9091	427.3355 (98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (210)
Space heating fuel (main heating system)	467.3947	309.8331	194.9296	38.9409	2.0208	0.0000	0.0000	0.0000	0.0000	48.1890	266.7895	481.2337 (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	274.8370	242.8918	257.5104	225.0126	217.2014	194.7067	191.3673	199.4890	202.2688	226.7697	242.6445	271.6409 (64)
Efficiency of water heater (217)m	84.9817	84.3400	83.1893	80.8921	79.8663	79.8000	79.8000	79.8000	79.8000	81.1049	84.0062	79.8000 (216)
Fuel for water heating, kWh/month	323.4071	287.9913	309.5476	278.1639	271.9562	243.9934	239.8086	249.9862	253.4696	279.6005	288.8413	319.3097 (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	32.5767	29.4241	32.5767	31.5258	32.5767	31.5258	32.5767	32.5767	31.5258	32.5767	31.5258	32.5767 (231)
Lighting	28.1776	22.6051	20.3534	14.9118	11.5183	9.4105	10.5074	13.6579	17.7402	23.2761	26.2903	28.9607 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-32.1361	-45.9126	-66.5489	-76.0881	-83.8233	-79.0394	-78.3480	-73.3018	-64.7928	-53.3754	-35.7105	-27.7932 (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	-13.4741	-27.6067	-52.5159	-75.7665	-97.9673	-97.5259	-96.7821	-83.4177	-63.3679	-38.8671	-17.8612	-10.7411 (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												1809.3313 (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												3346.0754 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:

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(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8820)	
mechanical ventilation fans (SFP = 0.8820)	297.5638 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	383.5638 (231)
Electricity for lighting (calculated in Appendix L)	227.4093 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1392.7639 (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	4373.6158 (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	1809.3313	0.2100	379.9596 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3346.0754	0.2100	702.6758 (264)
Space and water heating			1082.6354 (265)
Pumps, fans and electric keep-hot	383.5638	0.1387	53.2050 (267)
Energy for lighting	227.4093	0.1443	32.8222 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-716.8702	0.1342	-96.1890
PV Unit electricity exported	-675.8937	0.1269	-85.7748
Total			-181.9638 (269)
Total CO2, kg/year			986.6988 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			9.2800 (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	1809.3313	1.1300	2044.5443 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3346.0754	1.1300	3781.0651 (278)
Space and water heating			5825.6095 (279)
Pumps, fans and electric keep-hot	383.5638	1.5128	580.2553 (281)
Energy for lighting	227.4093	1.5338	348.8080 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-716.8702	1.4959	-1072.3502
PV Unit electricity exported	-675.8937	0.4659	-314.8832
Total			-1387.2334 (283)
Total Primary energy kWh/year			5367.4394 (286)
Dwelling Primary energy Rate (DPER)			50.4600 (287)

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

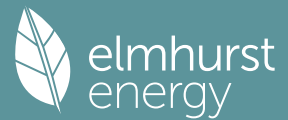
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	53.1800 (1b)	x 2.7400 (2b)	= 145.7132 (1b) - (3b)
First floor	53.1800 (1c)	x 2.4600 (2c)	= 130.8228 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	106.3600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 276.5360 (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	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1446 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3946 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3946 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
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												
Effective ac	0.5032	0.4933	0.4834	0.4341	0.4242	0.3749	0.3749	0.3650	0.3946	0.4242	0.4440	0.4637 (22b)
	0.6266	0.6217	0.6169	0.5942	0.5900	0.5703	0.5703	0.5666	0.5779	0.5900	0.5986	0.6075 (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			2.1000	1.0000	2.1000		(26)
TER Opening Type			13.8400	1.1450	15.8473		(27)
Heatloss Floor 1			53.1800	0.1300	6.9134		(28a)
External Wall GF	109.2500	15.9400	93.3100	0.1800	16.7958		(29a)
External Roof 1	53.1800		53.1800	0.1100	5.8498		(30)
Total net area of external elements Aum(A, m2)			215.6100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.5063		(33)
Main dwelling							
Party Wall 1			43.9400	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							471.5686 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E5 Ground floor (normal)				21.0300	0.1600	3.3648	
E6 Intermediate floor within a dwelling				21.0300	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)				8.4600	0.0600	0.5076	
E12 Gable (insulation at ceiling level)				12.6000	0.0600	0.7560	
E16 Corner (normal)				10.3900	0.0900	0.9351	
E18 Party wall between dwellings				10.3900	0.0600	0.6234	
E2 Other lintels (including other steel lintels)				11.4000	0.0500	0.5700	
E3 Sill				8.6000	0.0500	0.4300	
E4 Jamb				22.4000	0.0500	1.1200	
P1 Party wall - Ground floor				8.4600	0.0800	0.6768	
P4 Party wall - Roof (insulation at ceiling level)				8.4600	0.1200	1.0152	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.9989 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	57.5052 (37)

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

(38)m	Jan 57.1809	Feb 56.7323	Mar 56.2925	Apr 54.2272	May 53.8408	Jun 52.0420	Jul 52.0420	Aug 51.7089	Sep 52.7349	Oct 53.8408	Nov 54.6225	Dec 55.4398 (38)
Heat transfer coeff	114.6861	114.2375	113.7978	111.7325	111.3461	109.5472	109.5472	109.2141	110.2401	111.3461	112.1278	112.9450 (39)
Average = Sum(39)m / 12 =												111.7306
HLP	Jan 1.0783	Feb 1.0741	Mar 1.0699	Apr 1.0505	May 1.0469	Jun 1.0300	Jul 1.0300	Aug 1.0268	Sep 1.0365	Oct 1.0469	Nov 1.0542	Dec 1.0619 (40)
HLP (average)												1.0505
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

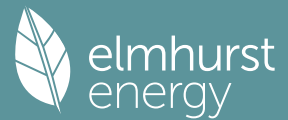
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7911 (42)
Hot water usage for mixer showers												
71.0177	69.9504	68.3952	65.4196	63.2237	60.7748	59.3829	60.9263	62.6182	65.2476	68.2871	70.7456 (42a)	
Hot water usage for baths												
30.6632	30.2078	29.5665	28.3841	27.4987	26.5169	25.9866	26.6234	27.3168	28.3673	29.5741	30.5595 (42b)	
Hot water usage for other uses												
43.2139	41.6424	40.0710	38.4996	36.9282	35.3568	35.3568	36.9282	38.4996	40.0710	41.6424	43.2139 (42c)	
Average daily hot water use (litres/day)												133.1908 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
144.8947	141.8006	138.0327	132.3033	127.6506	122.6486	120.7263	124.4780	128.4347	133.6859	139.5036	144.5189 (44)	
Energy content	229.4778	201.9222	212.1512	181.1166	171.8422	150.8107	146.0081	154.1298	158.3728	181.4105	198.7485	226.2817 (45)
Energy content (annual)										Total = Sum(45)m =		2212.2721
Distribution loss (46)m = 0.15 x (45)m												
34.4217	30.2883	31.8227	27.1675	25.7763	22.6216	21.9012	23.1195	23.7559	27.2116	29.8123	33.9423 (46)	
Water storage loss (or HIU loss):												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8381 (55)
Total storage loss												
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (56)
If cylinder contains dedicated solar storage												
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
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												
278.7205	246.3995	261.3939	228.7708	221.0849	198.4649	195.2507	203.3724	206.0270	230.6532	246.4027	275.5244 (62)	
WWHRS	-32.4663	-28.7135	-30.0671	-24.8968	-23.2029	-19.8549	-18.6108	-19.7907	-20.5426	-24.2175	-27.4355	-31.8651 (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												
246.2541	217.6860	231.3267	203.8741	197.8820	178.6101	176.6399	183.5817	185.4844	206.4357	218.9672	243.6593 (64)	
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				2490.4013 (64)
Electric shower(s)												2490 (64)
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												
115.6955	102.7209	109.9344	98.3446	96.5317	88.2679	87.9418	90.6423	90.7823	99.7131	104.2072	114.6328 (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
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(66)m	139.5560	139.5560	139.5560	139.5560	139.5560	139.5560	139.5560	139.5560	139.5560	139.5560	139.5560	139.5560 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	146.3897	162.0743	146.3897	151.2693	146.3897	151.2693	146.3897	146.3897	151.2693	146.3897	151.2693	146.3897 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	266.2188	268.9813	262.0199	247.1997	228.4920	210.9094	199.1631	196.4006	203.3620	218.1821	236.8899	254.4725 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.9556	36.9556	36.9556	36.9556	36.9556	36.9556	36.9556	36.9556	36.9556	36.9556	36.9556	36.9556 (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)	-111.6448	-111.6448	-111.6448	-111.6448	-111.6448	-111.6448	-111.6448	-111.6448	-111.6448	-111.6448	-111.6448	-111.6448 (71)
Water heating gains (Table 5)	155.5047	152.8585	147.7613	136.5898	129.7469	122.5943	118.2014	121.8310	126.0865	134.0230	144.7323	154.0764 (72)
Total internal gains	635.9800	651.7809	624.0376	602.9256	572.4954	549.6398	528.6209	529.4881	545.5847	566.4616	600.7583	622.8054 (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
South					5.6900	46.7521	0.6300	0.7000			0.7700			81.2989 (78)
West					8.1500	19.6403	0.6300	0.7000			0.7700			48.9189 (80)
Solar gains	130.2178	228.8425	327.2026	421.5371	481.4389	480.5907	462.3517	418.2186	360.4649	257.1623	157.3631			110.4783 (83)
Total gains	766.1978	880.6234	951.2402	1024.4627	1053.9342	1030.2305	990.9726	947.7066	906.0496	823.6240	758.1214			733.2836 (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	121.4815	121.9585	122.4297	124.6928	125.1255	127.1801	127.1801	127.5681	126.3808	125.1255	124.2532	123.3541
alpha	9.0988	9.1306	9.1620	9.3129	9.3417	9.4787	9.4787	9.5045	9.4254	9.3417	9.2835	9.2236
util living area	0.9999	0.9994	0.9973	0.9806	0.8951	0.6748	0.4861	0.5295	0.8086	0.9877	0.9994	0.9999 (86)
MIT	20.3137	20.4269	20.5807	20.7919	20.9448	20.9964	20.9998	20.9997	20.9832	20.7935	20.5204	20.3034 (87)
Th 2	20.0186	20.0221	20.0255	20.0415	20.0445	20.0584	20.0584	20.0610	20.0530	20.0445	20.0384	20.0321 (88)
util rest of house	0.9998	0.9990	0.9953	0.9667	0.8374	0.5790	0.3823	0.4218	0.7144	0.9760	0.9988	0.9998 (89)
MIT 2	19.2241	19.3721	19.5711	19.8458	20.0087	20.0573	20.0584	20.0610	20.0461	19.8539	19.5055	19.2221 (90)
Living area fraction									fLA = Living area / (4) =			0.1918 (91)
MIT	19.4331	19.5744	19.7647	20.0273	20.1882	20.2374	20.2390	20.2410	20.2259	20.0341	19.7002	19.4295 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4331	19.5744	19.7647	20.0273	20.1882	20.2374	20.2390	20.2410	20.2259	20.0341	19.7002	19.4295 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9997	0.9987	0.9946	0.9664	0.8473	0.5976	0.4022	0.4425	0.7329	0.9758	0.9986	0.9998 (94)
Useful gains	765.9463	879.4509	946.0769	990.0711	892.9697	615.6220	398.5980	419.3927	664.0153	803.6847	757.0334	733.1220 (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	1735.5570	1676.3637	1509.4965	1243.2781	945.1301	617.5663	398.6405	419.4938	675.3168	1050.4543	1412.8305	1720.0991 (97)
Space heating kWh	721.3903	535.5254	419.1842	182.3090	38.8074	0.0000	0.0000	0.0000	0.0000	183.5966	472.1739	734.3110 (98a)
Space heating requirement - total per year (kWh/year)												3287.2978
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	721.3903	535.5254	419.1842	182.3090	38.8074	0.0000	0.0000	0.0000	0.0000	183.5966	472.1739	734.3110 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3287.2978
Space heating per m2										(98c) / (4) =		30.9073 (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)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	721.3903	535.5254	419.1842	182.3090	38.8074	0.0000	0.0000	0.0000	0.0000	183.5966	472.1739	734.3110 (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)	781.5713	580.2009	454.1540	197.5179	42.0448	0.0000	0.0000	0.0000	0.0000	198.9129	511.5644	795.5698 (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	246.2541	217.6860	231.3267	203.8741	197.8820	178.6101	176.6399	183.5817	185.4844	206.4357	218.9672	243.6593 (64)
Efficiency of water heater (217)m	86.3224	85.9969	85.3759	83.8100	81.1485	79.8000	79.8000	79.8000	79.8000	83.7978	85.7365	79.8000 (216)
Fuel for water heating, kWh/month	285.2726	253.1323	270.9509	243.2576	243.8518	223.8221	221.3533	230.0523	232.4365	246.3497	255.3955	282.1013 (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)

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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	30.4169	24.4016	21.9709	16.0968	12.4336	10.1584	11.3424	14.7433	19.1500	25.1259	28.3796	31.2623	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-48.4057	-67.5486	-96.0888	-106.8433	-114.1620	-106.1289	-104.7737	-99.4099	-89.8065	-76.6523	-52.9539	-41.9280	(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	-29.4602	-61.7344	-122.2891	-183.0957	-241.5773	-242.5900	-239.7735	-203.2790	-149.3218	-88.1353	-39.2792	-23.3175	(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												3561.5361	(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												2987.9759	(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)												245.4817	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2628.5547	(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												4252.4389	(238)

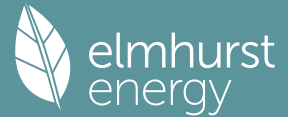
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3561.5361	0.2100	747.9226	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2987.9759	0.2100	627.4749	(264)
Space and water heating			1375.3975	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	245.4817	0.1443	35.4306	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1004.7016	0.1348	-135.4581	
PV Unit electricity exported	-1623.8531	0.1260	-204.5799	
Total			-340.0380	(269)
Total CO2, kg/year			1082.7193	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.1800	(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	3561.5361	1.1300	4024.5358	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2987.9759	1.1300	3376.4128	(278)
Space and water heating			7400.9486	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	245.4817	1.5338	376.5280	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1004.7016	1.4983	-1505.3454	
PV Unit electricity exported	-1623.8531	0.4625	-750.9548	
Total			-2256.3003	(283)
Total Primary energy kWh/year			5651.2771	(286)
Target Primary Energy Rate (TPER)			53.1300	(287)

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Plot Reference	4B8P				Issued on Date	30/03/2026	
Assessment Reference	BeLean			Plot Type Ref			
Plot Address	Midhurst, Land West of Gatesmead, Haywards Heath, RH161SN				SAP Version	10.2	
SAP Rating	92 A	DER	9.61	TER	10.82		
Environmental	91 B	% DER < TER				11.18	
CO ₂ Emissions (t/year)	1.16	DFEE	38.93	TFEE	46.98		
Compliance Check	See BREL	% DFEE < TFEE				17.13	
% DPER < TPER	8.19	DPER	52.24	TPER	56.90		
Assessor Details	Mr. Mirza Baig				Assessor ID	CK52-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	77.5400 (1b)	x 2.7400 (2b)	= 212.4596 (1b) - (3b)
First floor	64.8400 (1c)	x 2.4600 (2c)	= 159.5064 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	142.3800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 371.9660 (5)

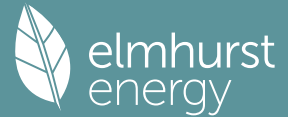
2. Ventilation rate

											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											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											3.0000 (17)		
Infiltration rate											0.1500 (18)		
Number of sides sheltered											0 (19)		
Shelter factor											(20) = 1 - [0.075 x (19)] =	1.0000 (20)	
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1500 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	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													
	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (22b)	
Balanced mechanical ventilation with heat recovery													
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)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													72.0000 (23c)
Effective ac	0.3312	0.3275	0.3237	0.3050	0.3013	0.2825	0.2825	0.2788	0.2900	0.3013	0.3087	0.3163 (25)	

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Front Door			2.1000	1.0000	2.1000		(26)
Window			29.2400	1.0536	30.8084		(27)
Heatloss Floor 1			77.5400	0.1000	7.7540	110.0000	8529.4000 (28a)
External Wall GF	196.0900	31.3400	164.7500	0.1600	26.3600	190.0000	31302.5000 (29a)
External Roof 1	64.8400		64.8400	0.1000	6.4840	9.0000	583.5600 (30)
Flat Roof	12.7000		12.7000	0.1000	1.2700	9.0000	114.3000 (30)
Total net area of external elements Aum(A, m ²)			351.1700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	74.7764		(33)
Main dwelling							
Internal Wall 1			287.3000			75.0000	21547.5000 (32c)
Internal Ceiling 1			64.8400			9.0000	583.5600 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	62660.8200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							440.0957 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	42.4400	0.0560	2.3766
E6 Intermediate floor within a dwelling	32.5200	0.0050	0.1626
E10 Eaves (insulation at ceiling level)	18.5400	0.0500	0.9270
E12 Gable (insulation at ceiling level)	14.1200	0.0570	0.8048
E16 Corner (normal)	39.9400	0.0360	1.4378
E17 Corner (inverted - internal area greater than external area)	19.1600	-0.0900	-1.7244
E2 Other lintels (including other steel lintels)	21.8000	0.0620	1.3516
E3 Sill	17.4000	0.0390	0.6786
E4 Jamb	55.6000	0.0520	2.8912
E24 Eaves (insulation at ceiling level - inverted)	10.8200	0.0750	0.8115
E14 Flat roof	7.8000	0.0700	0.5460
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			10.2634 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	85.0398 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	40.6605	40.2002	39.7399	37.4384	36.9781	34.6765	34.6765	34.2162	35.5971	36.9781	37.8987	38.8193 (38)
Heat transfer coeff	125.7004	125.2401	124.7798	122.4782	122.0179	119.7164	119.7164	119.2561	120.6370	122.0179	122.9385	123.8592 (39)
Average = Sum(39)m / 12 =												122.3632
HLP	0.8829	0.8796	0.8764	0.8602	0.8570	0.8408	0.8408	0.8376	0.8473	0.8570	0.8635	0.8699 (40)
HLP (average)												0.8594
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9215 (42)
Hot water usage for mixer showers	73.2035	72.1034	70.5003	67.4331	65.1696	62.6454	61.2106	62.8016	64.5455	67.2558	70.3889	72.9230 (42a)
Hot water usage for baths	31.6031	31.1338	30.4728	29.2542	28.3416	27.3298	26.7833	27.4396	28.1542	29.2369	30.4807	31.4963 (42b)
Hot water usage for other uses	44.5489	42.9290	41.3090	39.6890	38.0691	36.4491	36.4491	38.0691	39.6890	41.3090	42.9290	44.5489 (42c)
Average daily hot water use (litres/day)												137.2913 (43)
Daily hot water use	149.3556	146.1661	142.2822	136.3764	131.5804	126.4243	124.4430	128.3102	132.3888	137.8017	143.7985	148.9682 (44)
Energy conte	236.5427	208.1386	218.6824	186.6924	177.1325	155.4535	150.5030	158.8748	163.2486	186.9956	204.8673	233.2483 (45)
Energy content (annual)										Total = Sum(45)m =		2280.3796
Distribution loss (46)m = 0.15 x (45)m	35.4814	31.2208	32.8024	28.0039	26.5699	23.3180	22.5755	23.8312	24.4873	28.0493	30.7301	34.9872 (46)
Water storage loss (or HIU loss):												
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8100 (55)
Total storage loss	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100 (56)
If cylinder contains dedicated solar storage	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100 (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	284.9151	251.8298	267.0548	233.5044	225.5049	202.2655	198.8754	207.2472	210.0606	235.3680	251.6793	281.6207 (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	284.9151	251.8298	267.0548	233.5044	225.5049	202.2655	198.8754	207.2472	210.0606	235.3680	251.6793	281.6207 (64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2849.9256 (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	117.3484	104.1591	111.4098	99.5248	97.5945	89.1379	88.7402	91.5238	91.7297	100.8740	105.5680	116.2530 (65)

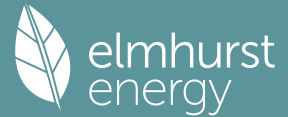
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	146.0742	146.0742	146.0742	146.0742	146.0742	146.0742	146.0742	146.0742	146.0742	146.0742	146.0742	146.0742 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	157.4197	174.2861	157.4197	162.6670	157.4197	162.6670	157.4197	157.4197	162.6670	157.4197	162.6670	157.4197 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	312.1022	315.3408	307.1795	289.8051	267.8731	247.2600	233.4893	230.2506	238.4119	255.7863	277.7184	298.3314 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6074	37.6074	37.6074	37.6074	37.6074	37.6074	37.6074	37.6074	37.6074	37.6074	37.6074	37.6074 (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)	-116.8593	-116.8593	-116.8593	-116.8593	-116.8593	-116.8593	-116.8593	-116.8593	-116.8593	-116.8593	-116.8593	-116.8593 (71)
Water heating gains (Table 5)	157.7263	154.9986	149.7444	138.2289	131.1754	123.8026	119.2744	123.0159	127.4024	135.5833	146.6222	156.2540 (72)
Total internal gains	697.0704	714.4478	684.1659	660.5233	626.2904	600.5519	577.0057	577.5085	595.3036	618.6115	656.8298	681.8273 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
East	16.2600	19.6403	0.4000	1.0000	0.7700	88.5240 (76)
South	4.3300	46.7521	0.4000	1.0000	0.7700	56.1154 (78)

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West	8.6500		19.6403		0.4000		1.0000		0.7700		47.0930 (80)	
Solar gains	191.7324	357.1982	553.9718	769.5105	918.7880	932.0892	890.7068	779.6440	630.4286	413.9212	235.6144	160.0137 (83)
Total gains	888.8028	1071.6460	1238.1376	1430.0338	1545.0784	1532.6412	1467.7125	1357.1525	1225.7322	1032.5327	892.4442	841.8410 (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	138.4704	138.9793	139.4920	142.1133	142.6494	145.3918	145.3918	145.9530	144.2823	142.6494	141.5812	140.5288
alpha	10.2314	10.2653	10.2995	10.4742	10.5100	10.6928	10.6928	10.7302	10.6188	10.5100	10.4387	10.3686
util living area	0.9999	0.9993	0.9936	0.9282	0.7266	0.4998	0.3589	0.4042	0.6755	0.9765	0.9995	0.9999 (86)
MIT	20.4130	20.5413	20.7189	20.9248	20.9941	20.9999	21.0000	21.0000	20.9978	20.8732	20.6029	20.3982 (87)
Th 2	20.5586	20.5602	20.5618	20.5699	20.5715	20.5796	20.5796	20.5812	20.5764	20.5715	20.5683	20.5650 (88)
util rest of house	0.9999	0.9991	0.9917	0.9126	0.6955	0.4670	0.3246	0.3674	0.6355	0.9682	0.9993	0.9999 (89)
MIT 2	19.9984	20.1281	20.3062	20.5095	20.5677	20.5795	20.5796	20.5812	20.5752	20.4660	20.1969	19.9894 (90)
Living area fraction	20.0902	20.2196	20.3975	20.6014	20.6621	20.6726	20.6727	20.6739	20.6688	20.5561	20.2868	20.0799 (91)
MIT	20.0902	20.2196	20.3975	20.6014	20.6621	20.6726	20.6727	20.6739	20.6688	20.5561	20.2868	20.0799 (92)
Temperature adjustment	20.0902	20.2196	20.3975	20.6014	20.6621	20.6726	20.6727	20.6739	20.6688	20.5561	20.2868	0.0000
adjusted MIT	20.0902	20.2196	20.3975	20.6014	20.6621	20.6726	20.6727	20.6739	20.6688	20.5561	20.2868	20.0799 (93)

8. Space heating requirement												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9999	0.9989	0.9909	0.9138	0.7022	0.4743	0.3322	0.3756	0.6443	0.9679	0.9991	0.9999 (94)
Useful gains	888.6707	1070.4463	1226.8663	1306.8285	1084.9252	726.8572	487.5613	509.6814	789.6902	999.3706	891.6543	841.7684 (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	1984.8339	1918.6246	1734.1314	1433.1698	1093.5363	726.9887	487.5638	509.6901	792.4353	1214.8232	1621.1664	1966.8700 (97)
Space heating kWh	815.5454	569.9758	377.4053	90.9657	6.4067	0.0000	0.0000	0.0000	0.0000	160.2967	525.2487	837.0756 (98a)
Space heating requirement - total per year (kWh/year)												3382.9199
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	815.5454	569.9758	377.4053	90.9657	6.4067	0.0000	0.0000	0.0000	0.0000	160.2967	525.2487	837.0756 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3382.9199
Space heating per m2										(98c) / (4) =		23.7598 (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 %)												88.8000 (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	815.5454	569.9758	377.4053	90.9657	6.4067	0.0000	0.0000	0.0000	0.0000	160.2967	525.2487	837.0756 (98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (210)
Space heating fuel (main heating system)	918.4070	641.8647	425.0059	102.4389	7.2147	0.0000	0.0000	0.0000	0.0000	180.5143	591.4963	942.6527 (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	284.9151	251.8298	267.0548	233.5044	225.5049	202.2655	198.8754	207.2472	210.0606	235.3680	251.6793	281.6207 (64)
Efficiency of water heater (217)m	86.2806	85.8336	84.8352	82.1337	80.0241	79.8000	79.8000	79.8000	79.8000	83.2169	85.6701	79.8000 (216)
Fuel for water heating, kWh/month	330.2191	293.3932	314.7924	284.2978	281.7963	253.4655	249.2173	259.7083	263.2338	282.8366	293.7774	86.3484 (217)
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 (219)
Pumps and Fa	41.2980	37.3014	41.2980	39.9658	41.2980	39.9658	41.2980	41.2980	39.9658	41.2980	39.9658	41.2980 (221)
Lighting	35.5794	28.5431	25.6999	18.8289	14.5440	11.8825	13.2675	17.2456	22.4003	29.3904	33.1964	36.5683 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-44.4615	-62.7079	-89.8090	-101.4646	-110.7621	-104.1000	-103.1992	-97.0488	-86.5311	-72.3286	-49.1232	-38.5506 (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	-21.0158	-42.8352	-81.1184	-116.5353	-150.2133	-149.3741	-148.2147	-127.9351	-97.4541	-60.0932	-27.7833	-16.7686 (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												3809.5945 (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												3432.8822 (219)
Space cooling fuel												0.0000 (221)

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Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8820)		
mechanical ventilation fans (SFP = 0.8820)		400.2503 (230a)
central heating pump		41.0000 (230c)
main heating flue fan		45.0000 (230e)
Total electricity for the above, kWh/year		486.2503 (231)
Electricity for lighting (calculated in Appendix L)		287.1465 (232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation		-1999.4279 (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		6016.4456 (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	3809.5945	0.2100	800.0149 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3432.8822	0.2100	720.9053 (264)
Space and water heating			1520.9201 (265)
Pumps, fans and electric keep-hot	486.2503	0.1387	67.4489 (267)
Energy for lighting	287.1465	0.1443	41.4441 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-960.0868	0.1344	-129.0627
PV Unit electricity exported	-1039.3412	0.1270	-132.0399
Total			-261.1026 (269)
Total CO2, kg/year			1368.7105 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			9.6100 (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	3809.5945	1.1300	4304.8418 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3432.8822	1.1300	3879.1569 (278)
Space and water heating			8183.9987 (279)
Pumps, fans and electric keep-hot	486.2503	1.5128	735.5994 (281)
Energy for lighting	287.1465	1.5338	440.4348 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-960.0868	1.4968	-1437.0697
PV Unit electricity exported	-1039.3412	0.4664	-484.7305
Total			-1921.8001 (283)
Total Primary energy kWh/year			7438.2329 (286)
Dwelling Primary energy Rate (DPER)			52.2400 (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	77.5400 (1b)	x 2.7400 (2b)	= 212.4596 (1b) - (3b)
First floor	64.8400 (1c)	x 2.4600 (2c)	= 159.5064 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	142.3800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	371.9660 (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	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1075 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3575 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3575 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
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												
Effective ac	0.4559	0.4469	0.4380	0.3933	0.3844	0.3397	0.3397	0.3307	0.3575	0.3844	0.4022	0.4201 (22b)
	0.6039	0.5999	0.5959	0.5773	0.5739	0.5577	0.5577	0.5547	0.5639	0.5739	0.5809	0.5882 (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			2.1000	1.0000	2.1000		(26)
TER Opening Type			29.2400	1.1450	33.4809		(27)
Heatloss Floor 1			77.5400	0.1300	10.0802		(28a)
External Wall GF	196.0900	31.3400	164.7500	0.1800	29.6550		(29a)
External Roof 1	64.8400		64.8400	0.1100	7.1324		(30)
Flat Roof	12.7000		12.7000	0.1100	1.3970		(30)
Total net area of external elements Aum(A, m2)			351.1700				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	83.8455	(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K

440.0957 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	42.4400	0.1600	6.7904
E6 Intermediate floor within a dwelling	32.5200	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	18.5400	0.0600	1.1124
E12 Gable (insulation at ceiling level)	14.1200	0.0600	0.8472
E16 Corner (normal)	39.9400	0.0900	3.5946
E17 Corner (inverted - internal area greater than external area)	19.1600	-0.0900	-1.7244
E2 Other lintels (including other steel lintels)	21.8000	0.0500	1.0900
E3 Sill	17.4000	0.0500	0.8700
E4 Jamb	55.6000	0.0500	2.7800
E24 Eaves (insulation at ceiling level - inverted)	10.8200	0.2400	2.5968
E14 Flat roof	7.8000	0.0800	0.6240

Thermal bridges (Sum(L x Psi) calculated using Appendix K)

18.5810 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 102.4265 (37)

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

(38)m	Jan 74.1285	Feb 73.6332	Mar 73.1478	Apr 70.8676	May 70.4410	Jun 68.4551	Jul 68.4551	Aug 68.0873	Sep 69.2200	Oct 70.4410	Nov 71.3040	Dec 72.2063 (38)
Heat transfer coeff	176.5550	176.0597	175.5743	173.2941	172.8675	170.8816	170.8816	170.5138	171.6465	172.8675	173.7305	174.6328 (39)
Average = Sum(39)m / 12 =												173.2921

HLP	Jan 1.2400	Feb 1.2365	Mar 1.2331	Apr 1.2171	May 1.2141	Jun 1.2002	Jul 1.2002	Aug 1.1976	Sep 1.2056	Oct 1.2141	Nov 1.2202	Dec 1.2265 (40)
HLP (average)												1.2171
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

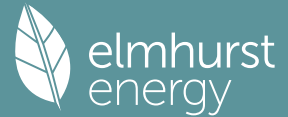
Assumed occupancy												2.9215 (42)
Hot water usage for mixer showers	73.2035	72.1034	70.5003	67.4331	65.1696	62.6454	61.2106	62.8016	64.5455	67.2558	70.3889	72.9230 (42a)
Hot water usage for baths	31.6031	31.1338	30.4728	29.2542	28.3416	27.3298	26.7833	27.4396	28.1542	29.2369	30.4807	31.4963 (42b)
Hot water usage for other uses	44.5489	42.9290	41.3090	39.6890	38.0691	36.4491	36.4491	38.0691	39.6890	41.3090	42.9290	44.5489 (42c)
Average daily hot water use (litres/day)												137.2913 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	149.3556	146.1661	142.2822	136.3764	131.5804	126.4243	124.4430	128.3102	132.3888	137.8017	143.7985	148.9682 (44)
Energy content (annual)	236.5427	208.1386	218.6824	186.6924	177.1325	155.4535	150.5030	158.8748	163.2486	186.9956	204.8673	233.2483 (45)
Distribution loss (46)m = 0.15 x (45)m	35.4814	31.2208	32.8024	28.0039	26.5699	23.3180	22.5755	23.8312	24.4873	28.0493	30.7301	34.9872 (46)
Water storage loss (or HIU loss):												
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6525 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8924 (55)
Total storage loss	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637 (56)
If cylinder contains dedicated solar storage	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637 (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	287.4688	254.1364	269.6085	235.9757	228.0585	204.7367	201.4291	209.8009	212.5319	237.9217	254.1506	284.1743 (62)
WWHRS	-33.4656	-29.5972	-30.9925	-25.6630	-23.9170	-20.4660	-19.1836	-20.3998	-21.1749	-24.9629	-28.2799	-32.8459 (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	254.0032	224.5391	238.6159	210.3127	204.1415	184.2708	182.2455	189.4011	191.3570	212.9588	225.8707	251.3285 (64)
12Total per year (kWh/year)												2569.0448 (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)
												0.0000 (64a)
Heat gains from water heating, kWh/month	119.3913	106.0043	113.4527	101.5019	99.6374	91.1149	90.7831	93.5667	93.7068	102.9169	107.5450	118.2959 (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
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(66)m	146.0742	146.0742	146.0742	146.0742	146.0742	146.0742	146.0742	146.0742	146.0742	146.0742	146.0742	146.0742	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	158.1280	175.0703	158.1280	163.3989	158.1280	163.3989	158.1280	158.1280	163.3989	158.1280	163.3989	158.1280	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	312.1022	315.3408	307.1795	289.8051	267.8731	247.2600	233.4893	230.2506	238.4119	255.7863	277.7184	298.3314	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6074	37.6074	37.6074	37.6074	37.6074	37.6074	37.6074	37.6074	37.6074	37.6074	37.6074	37.6074	(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)	-116.8593	-116.8593	-116.8593	-116.8593	-116.8593	-116.8593	-116.8593	-116.8593	-116.8593	-116.8593	-116.8593	-116.8593	(71)
Water heating gains (Table 5)	160.4722	157.7445	152.4903	140.9748	133.9212	126.5485	122.0203	125.7618	130.1483	138.3292	149.3681	158.9999	(72)
Total internal gains	700.5246	717.9778	687.6200	664.0011	629.7446	604.0297	580.4598	580.9626	598.7814	622.0657	660.3076	685.2815	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W
East					16.2600	19.6403		0.6300	0.7000	0.7700		97.5977 (76)
South					4.3300	46.7521		0.6300	0.7000	0.7700		61.8672 (78)
West					8.6500	19.6403		0.6300	0.7000	0.7700		51.9201 (80)
Solar gains	211.3850	393.8111	610.7539	848.3853	1012.9638	1027.6284	982.0043	859.5575	695.0475	456.3481	259.7648	176.4151 (83)
Total gains	911.9096	1111.7889	1298.3739	1512.3865	1642.7084	1631.6581	1562.4641	1440.5202	1293.8289	1078.4138	920.0725	861.6966 (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)													
tau	98.5856	98.8629	99.1363	100.4407	100.6886	101.8587	101.8587	102.0784	101.4048	100.6886	100.1884	99.6708	
alpha	7.5724	7.5909	7.6091	7.6960	7.7126	7.7906	7.7906	7.8052	7.7603	7.7126	7.6792	7.6447	
util living area	0.9999	0.9995	0.9971	0.9761	0.8755	0.6602	0.4804	0.5423	0.8430	0.9921	0.9996	0.9999	(86)
MIT	20.0520	20.1975	20.4171	20.7103	20.9208	20.9923	20.9994	20.9985	20.9563	20.6602	20.3025	20.0340	(87)
Th 2	19.8881	19.8909	19.8936	19.9063	19.9087	19.9199	19.9199	19.9219	19.9156	19.9087	19.9039	19.8988	(88)
util rest of house	0.9998	0.9992	0.9951	0.9600	0.8110	0.5545	0.3630	0.4166	0.7453	0.9845	0.9993	0.9999	(89)
MIT 2	18.7889	18.9776	19.2602	19.6336	19.8568	19.9173	19.9198	19.9217	19.8952	19.5807	19.1227	18.7743	(90)
Living area fraction	19.0685	19.2477	19.5163	19.8719	20.0923	20.1553	20.1588	20.1601	20.1301	19.8197	19.3839	19.0532	(91)
MIT	19.0685	19.2477	19.5163	19.8719	20.0923	20.1553	20.1588	20.1601	20.1301	19.8197	19.3839	19.0532	(92)
Temperature adjustment	19.0685	19.2477	19.5163	19.8719	20.0923	20.1553	20.1588	20.1601	20.1301	19.8197	19.3839	19.0532	(93)
adjusted MIT	19.0685	19.2477	19.5163	19.8719	20.0923	20.1553	20.1588	20.1601	20.1301	19.8197	19.3839	19.0532	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9998	0.9989	0.9941	0.9593	0.8233	0.5782	0.3891	0.4446	0.7670	0.9836	0.9991	0.9999	(94)
Useful gains	911.7016	1110.5616	1290.7234	1450.8238	1352.4471	943.4087	607.8915	640.5048	992.3664	1060.6814	919.2536	861.5704	(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	2607.4551	2526.0506	2285.3356	1901.3715	1450.7631	949.2966	608.1299	641.1468	1035.0440	1593.7890	2134.0875	2593.8500	(97)
Space heating kWh	1261.6407	951.2087	739.9915	324.3943	73.1471	0.0000	0.0000	0.0000	0.0000	396.6320	874.6804	1288.8160	(98a)
Space heating requirement - total per year (kWh/year)												5910.5107	
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	1261.6407	951.2087	739.9915	324.3943	73.1471	0.0000	0.0000	0.0000	0.0000	396.6320	874.6804	1288.8160	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5910.5107	
Space heating per m2										(98c) / (4) =		41.5122	(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)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	1261.6407	951.2087	739.9915	324.3943	73.1471	0.0000	0.0000	0.0000	0.0000	396.6320	874.6804	1288.8160	(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)	1366.8913	1030.5619	801.7243	351.4565	79.2493	0.0000	0.0000	0.0000	0.0000	429.7205	947.6494	1396.3337	(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	254.0032	224.5391	238.6159	210.3127	204.1415	184.2708	182.2455	189.4011	191.3570	212.9588	225.8707	251.3285	(64)	
Efficiency of water heater (217)m	87.1527	86.9277	86.4234	85.0282	81.9921	79.8000	79.8000	79.8000	79.8000	85.4339	86.7911	87.1952	(216)	
Fuel for water heating, kWh/month	291.4460	258.3056	276.1012	247.3447	248.9769	230.9158	228.3778	237.3447	239.7957	249.2673	260.2465	288.2365	(217)	
Space cooling fuel requirement														

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(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	7.0685	7.3041	7.0685	7.3041	7.0685	(231)
Lighting	32.8559	26.3582	23.7326	17.3875	13.4306	10.9730	12.2519	15.9255	20.6856	27.1406	30.6553	33.7690	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-66.4249	-90.6864	-126.2494	-137.2779	-144.1182	-133.0186	-131.2135	-125.6434	-115.4359	-101.2768	-71.8971	-57.7678	(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	-47.1089	-97.8168	-192.1601	-285.4724	-374.5736	-375.4369	-371.1595	-315.6972	-233.2293	-138.9946	-62.5849	-37.3645	(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												6403.5869	(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												3056.3588	(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)												265.1657	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3832.6088	(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												5978.5026	(238)

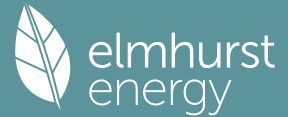
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	6403.5869	0.2100	1344.7532 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3056.3588	0.2100	641.8353 (264)
Space and water heating			1986.5886 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	265.1657	0.1443	38.2716 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1301.0100	0.1353	-176.0360
PV Unit electricity exported	-2531.5988	0.1262	-319.5208
Total			-495.5568 (269)
Total CO2, kg/year			1541.2326 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.8200 (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	6403.5869	1.1300	7236.0531 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3056.3588	1.1300	3453.6854 (278)
Space and water heating			10689.7385 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	265.1657	1.5338	406.7201 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1301.0100	1.5001	-1951.6614
PV Unit electricity exported	-2531.5988	0.4633	-1172.8956
Total			-3124.5569 (283)
Total Primary energy kWh/year			8102.0025 (286)
Target Primary Energy Rate (TPER)			56.9000 (287)

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Plot Reference	5B9P				Issued on Date	30/03/2026	
Assessment Reference	BeLean			Plot Type Ref			
Plot Address	Whitchurch, Land West of Gatesmead, Haywards Heath, RH161SN				SAP Version	10.2	
SAP Rating	92 A	DER	8.99	TER	10.11		
Environmental	91 B	% DER < TER				11.08	
CO ₂ Emissions (t/year)	1.35	DFEE	38.95	TFEE	45.56		
Compliance Check	See BREL	% DFEE < TFEE				14.50	
% DPER < TPER	7.35	DPER	49.36	TPER	53.28		
Assessor Details	Mr. Mirza Baig				Assessor ID	CK52-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	90.5900 (1b)	x 2.7400 (2b)	= 248.2166 (1b) - (3b)
First floor	89.2600 (1c)	x 2.4600 (2c)	= 219.5796 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	179.8500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 467.7962 (5)

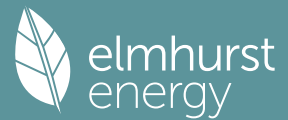
2. Ventilation rate

											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											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											3.0000 (17)		
Infiltration rate											0.1500 (18)		
Number of sides sheltered											0 (19)		
Shelter factor											(20) = 1 - [0.075 x (19)] =	1.0000 (20)	
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1500 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	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													
	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (22b)	
Balanced mechanical ventilation with heat recovery													
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)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													71.2000 (23c)
Effective ac	0.3352	0.3315	0.3277	0.3090	0.3052	0.2865	0.2865	0.2827	0.2940	0.3052	0.3127	0.3202 (25)	

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Front Door			2.1000	1.0000	2.1000		(26)
Window			27.6800	1.0536	29.1648		(27)
Heatloss Floor 1			90.5900	0.1000	9.0590	110.0000	9964.9000 (28a)
External Wall GF	208.0700	29.7800	178.2900	0.1600	28.5264	190.0000	33875.1000 (29a)
External Roof 1	89.2600		89.2600	0.1000	8.9260	9.0000	803.3400 (30)
Flat Roof	1.3300		1.3300	0.1000	0.1330	9.0000	11.9700 (30)
Total net area of external elements Aum(A, m ²)			389.2500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		77.9092		(33)
Main dwelling							
Internal Wall 1			316.1000			75.0000	23707.5000 (32c)
Internal Ceiling 1			89.2600			9.0000	803.3400 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	69166.1500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							384.5769 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	40.6300	0.0560	2.2753
E6 Intermediate floor within a dwelling	30.5400	0.0050	0.1527
E10 Eaves (insulation at ceiling level)	30.5400	0.0500	1.5270
E12 Gable (insulation at ceiling level)	8.4600	0.0570	0.4822
E16 Corner (normal)	31.4500	0.0360	1.1322
E17 Corner (inverted - internal area greater than external area)	10.6700	-0.0900	-0.9603
E2 Other lintels (including other steel lintels)	20.9500	0.0620	1.2989
E3 Sill	16.0500	0.0390	0.6260
E4 Jamb	46.6000	0.0520	2.4232
E24 Eaves (insulation at ceiling level - inverted)	4.4000	0.0750	0.3300
E14 Flat roof	3.0900	0.0700	0.2163
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.5034 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	87.4126 (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	51.7535	51.1746	50.5957	47.7012	47.1223	44.2278	44.2278	43.6489	45.3856	47.1223	48.2801	49.4379	(38)
Heat transfer coeff	139.1661	138.5872	138.0083	135.1138	134.5349	131.6404	131.6404	131.0615	132.7982	134.5349	135.6927	136.8505	(39)
Average = Sum(39)m / 12 =												134.9691	
HLP	0.7738	0.7706	0.7674	0.7513	0.7480	0.7319	0.7319	0.7287	0.7384	0.7480	0.7545	0.7609	(40)
HLP (average)												0.7505	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9756 (42)
Hot water usage for mixer showers	74.1112	72.9974	71.3745	68.2693	65.9777	63.4221	61.9696	63.5802	65.3458	68.0897	71.2616	73.8272	(42a)
Hot water usage for baths	31.9934	31.5183	30.8492	29.6155	28.6917	27.6674	27.1141	27.7785	28.5019	29.5980	30.8571	31.8853	(42b)
Hot water usage for other uses	45.1033	43.4632	41.8231	40.1829	38.5428	36.9027	36.9027	38.5428	40.1829	41.8231	43.4632	45.1033	(42c)
Average daily hot water use (litres/day)												138.9940	(43)
Daily hot water use	151.2079	147.9789	144.0467	138.0677	133.2122	127.9922	125.9863	129.9015	134.0307	139.5108	145.5819	150.8158	(44)
Energy conte	239.4764	210.7200	221.3945	189.0077	179.3292	157.3813	152.3696	160.8452	165.2732	189.3148	207.4081	236.1411	(45)
Energy content (annual)										Total = Sum(45)m =		2308.6612	
Distribution loss (46)m = 0.15 x (45)m	35.9215	31.6080	33.2092	28.3512	26.8994	23.6072	22.8554	24.1268	24.7910	28.3972	31.1112	35.4212	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8100	(55)
Total storage loss	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	(56)
If cylinder contains dedicated solar storage	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	(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	287.8488	254.4112	269.7669	235.8197	227.7016	204.1933	200.7420	209.2176	212.0852	237.6872	254.2201	284.5135	(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	287.8488	254.4112	269.7669	235.8197	227.7016	204.1933	200.7420	209.2176	212.0852	237.6872	254.2201	284.5135	(64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2878.2072	(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	118.3238	105.0174	112.3116	100.2947	98.3249	89.7789	89.3608	92.1790	92.4030	101.6451	106.4128	117.2148	(65)

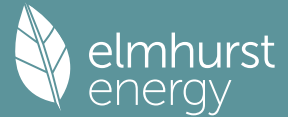
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	148.7809	148.7809	148.7809	148.7809	148.7809	148.7809	148.7809	148.7809	148.7809	148.7809	148.7809	148.7809	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	177.3392	196.3399	177.3392	183.2505	177.3392	183.2505	177.3392	177.3392	183.2505	177.3392	183.2505	177.3392	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	351.4669	355.1141	345.9234	326.3576	301.6593	278.4464	262.9388	259.2916	268.4823	288.0481	312.7464	335.9593	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.8781	37.8781	37.8781	37.8781	37.8781	37.8781	37.8781	37.8781	37.8781	37.8781	37.8781	37.8781	(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)	-119.0247	-119.0247	-119.0247	-119.0247	-119.0247	-119.0247	-119.0247	-119.0247	-119.0247	-119.0247	-119.0247	-119.0247	(71)
Water heating gains (Table 5)	159.0374	156.2758	150.9564	139.2982	132.1571	124.6929	120.1086	123.8965	128.3374	136.6197	147.7956	157.5468	(72)
Total internal gains	758.4778	778.3640	744.8533	719.5406	681.7899	654.0241	628.0209	628.1616	647.7045	672.6413	714.4267	741.4796	(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	11.6300	10.6334	0.4000	1.0000	0.7700	34.2803 (74)
East	4.0500	19.6403	0.4000	1.0000	0.7700	22.0493 (76)

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West	12.0000		19.6403		0.4000		1.0000		0.7700		65.3314 (80)	
Solar gains	121.6610	236.4466	392.8259	589.3680	744.0275	772.9297	731.1127	612.2190	461.2457	280.8118	151.2427	100.4354 (83)
Total gains	880.1388	1014.8107	1137.6792	1308.9086	1425.8174	1426.9539	1359.1335	1240.3806	1108.9502	953.4531	865.6694	841.9150 (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	138.0568	138.6335	139.2150	142.1973	142.8092	145.9493	145.9493	146.5939	144.6768	142.8092	141.5907	140.3928
alpha	10.2038	10.2422	10.2810	10.4798	10.5206	10.7300	10.7300	10.7729	10.6451	10.5206	10.4394	10.3595
util living area	1.0000	0.9998	0.9987	0.9790	0.8426	0.5896	0.4261	0.4859	0.8052	0.9943	0.9998	1.0000 (86)
MIT	20.3658	20.4654	20.6198	20.8443	20.9780	20.9995	21.0000	20.9999	20.9897	20.8012	20.5506	20.3589 (87)
Th 2	20.6131	20.6147	20.6163	20.6244	20.6260	20.6340	20.6340	20.6356	20.6308	20.6260	20.6228	20.6195 (88)
util rest of house	1.0000	0.9998	0.9983	0.9735	0.8169	0.5562	0.3907	0.4475	0.7689	0.9922	0.9998	1.0000 (89)
MIT 2	20.0025	20.1036	20.2592	20.4879	20.6101	20.6337	20.6340	20.6356	20.6243	20.4485	20.1959	20.0013 (90)
Living area fraction	fLA = Living area / (4) = 0.2088 (91)											
MIT	20.0784	20.1791	20.3345	20.5623	20.6869	20.7101	20.7104	20.7117	20.7006	20.5221	20.2699	20.0760 (92)
Temperature adjustment	0.0000											
adjusted MIT	20.0784	20.1791	20.3345	20.5623	20.6869	20.7101	20.7104	20.7117	20.7006	20.5221	20.2699	20.0760 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9999	0.9997	0.9980	0.9725	0.8212	0.5631	0.3981	0.4555	0.7759	0.9915	0.9997	1.0000 (94)
Useful gains	880.0920	1014.5279	1135.4294	1272.9161	1170.9208	803.5867	541.0818	565.0306	860.4850	945.3830	865.4384	841.8870 (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	2195.8142	2117.4887	1909.2737	1575.7335	1209.0506	804.3354	541.0985	565.0952	876.5503	1334.8674	1787.0606	2172.6332 (97)
Space heating kWh	978.8973	741.1896	575.7401	218.0285	28.3685	0.0000	0.0000	0.0000	0.0000	289.7764	663.5679	990.0752 (98a)
Space heating requirement - total per year (kWh/year)	4485.6437											
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	978.8973	741.1896	575.7401	218.0285	28.3685	0.0000	0.0000	0.0000	0.0000	289.7764	663.5679	990.0752 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	4485.6437											
Space heating per m2	(98c) / (4) = 24.9410 (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 %)												88.8000 (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	978.8973	741.1896	575.7401	218.0285	28.3685	0.0000	0.0000	0.0000	0.0000	289.7764	663.5679	990.0752 (98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (210)
Space heating fuel (main heating system)	1102.3618	834.6730	648.3560	245.5276	31.9466	0.0000	0.0000	0.0000	0.0000	326.3248	747.2612	1114.9495 (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	287.8488	254.4112	269.7669	235.8197	227.7016	204.1933	200.7420	209.2176	212.0852	237.6872	254.2201	284.5135 (64)
Efficiency of water heater (217)m	86.5811	86.3125	85.7156	83.8843	80.7062	79.8000	79.8000	79.8000	79.8000	84.5053	86.1099	79.8000 (216)
Fuel for water heating, kWh/month	332.4614	294.7559	314.7232	281.1252	282.1365	255.8814	251.5563	262.1775	265.7710	281.2691	295.2274	86.6193 (217)
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	57.5205	51.9540	57.5205	55.6650	57.5205	55.6650	57.5205	57.5205	55.6650	57.5205	55.6650	57.5205 (231)
Lighting	42.2139	33.8655	30.4922	22.3399	17.2560	14.0983	15.7415	20.4614	26.5773	34.8708	39.3865	43.3871 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-52.4879	-73.8576	-105.5620	-119.0469	-129.8179	-122.0190	-121.0281	-113.9268	-101.6965	-85.1643	-57.9593	-45.5365 (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	-25.3012	-51.5313	-97.5057	-139.9445	-180.2299	-179.1169	-177.6602	-153.3618	-116.8843	-72.1574	-33.4082	-20.1846 (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	5051.4006 (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	3445.5491 (219)											
Space cooling fuel	0.0000 (221)											

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Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.0360)		
mechanical ventilation fans (SFP = 1.0360)		591.2570 (230a)
central heating pump		41.0000 (230c)
main heating flue fan		45.0000 (230e)
Total electricity for the above, kWh/year		677.2570 (231)
Electricity for lighting (calculated in Appendix L)		340.6903 (232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation		-2375.3888 (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		7139.5081 (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	5051.4006	0.2100	1060.7941 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3445.5491	0.2100	723.5653 (264)
Space and water heating			1784.3594 (265)
Pumps, fans and electric keep-hot	677.2570	0.1387	93.9439 (267)
Energy for lighting	340.6903	0.1443	49.1721 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1128.1029	0.1345	-151.6832
PV Unit electricity exported	-1247.2859	0.1271	-158.5058
Total			-310.1890 (269)
Total CO2, kg/year			1617.2865 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			8.9900 (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	5051.4006	1.1300	5708.0827 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3445.5491	1.1300	3893.4704 (278)
Space and water heating			9601.5531 (279)
Pumps, fans and electric keep-hot	677.2570	1.5128	1024.5543 (281)
Energy for lighting	340.6903	1.5338	522.5621 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1128.1029	1.4969	-1688.6871
PV Unit electricity exported	-1247.2859	0.4665	-581.8919
Total			-2270.5790 (283)
Total Primary energy kWh/year			8878.0905 (286)
Dwelling Primary energy Rate (DPER)			49.3600 (287)

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

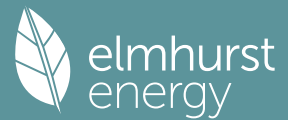
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	90.5900 (1b)	x 2.7400 (2b)	= 248.2166 (1b) - (3b)
First floor	89.2600 (1c)	x 2.4600 (2c)	= 219.5796 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	179.8500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	467.7962 (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	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.0855 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3355 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3355 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000	(22)
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													
Effective ac	0.4278	0.4194	0.4110	0.3691	0.3607	0.3187	0.3187	0.3103	0.3355	0.3607	0.3774	0.3942	(22b)
	0.5915	0.5879	0.5845	0.5681	0.5650	0.5508	0.5508	0.5482	0.5563	0.5650	0.5712	0.5777	(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			2.1000	1.0000	2.1000		(26)
TER Opening Type			27.6800	1.1450	31.6947		(27)
Heatloss Floor 1			90.5900	0.1300	11.7767		(28a)
External Wall GF	208.0700	29.7800	178.2900	0.1800	32.0922		(29a)
External Roof 1	89.2600		89.2600	0.1100	9.8186		(30)
Flat Roof	1.3300		1.3300	0.1100	0.1463		(30)
Total net area of external elements Aum(A, m2)			389.2500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	87.6285	(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K

384.5769 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	40.6300	0.1600	6.5008
E6 Intermediate floor within a dwelling	30.5400	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	30.5400	0.0600	1.8324
E12 Gable (insulation at ceiling level)	8.4600	0.0600	0.5076
E16 Corner (normal)	31.4500	0.0900	2.8305
E17 Corner (inverted - internal area greater than external area)	10.6700	-0.0900	-0.9603
E2 Other lintels (including other steel lintels)	20.9500	0.0500	1.0475
E3 Sill	16.0500	0.0500	0.8025
E4 Jamb	46.6000	0.0500	2.3300
E24 Eaves (insulation at ceiling level - inverted)	4.4000	0.2400	1.0560
E14 Flat roof	3.0900	0.0800	0.2472

Thermal bridges (Sum(L x Psi) calculated using Appendix K)

16.1942 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 103.8227 (37)

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

(38)m	Jan 91.3106	Feb 90.7621	Mar 90.2245	Apr 87.6995	May 87.2270	Jun 85.0277	Jul 85.0277	Aug 84.6205	Sep 85.8749	Oct 87.2270	Nov 88.1828	Dec 89.1819	(38)
Heat transfer coeff	195.1333	194.5848	194.0472	191.5221	191.0497	188.8504	188.8504	188.4431	189.6975	191.0497	192.0054	193.0046	(39)
Average = Sum(39)m / 12 =												191.5198	

HLP	Jan 1.0850	Feb 1.0819	Mar 1.0789	Apr 1.0649	May 1.0623	Jun 1.0500	Jul 1.0500	Aug 1.0478	Sep 1.0548	Oct 1.0623	Nov 1.0676	Dec 1.0731	(40)
HLP (average)												1.0649	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

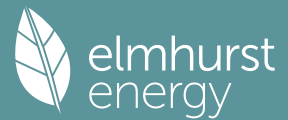
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9756 (42)
Hot water usage for mixer showers													
74.1112	72.9974	71.3745	68.2693	65.9777	63.4221	61.9696	63.5802	65.3458	68.0897	71.2616	73.8272	73.8272	(42a)
Hot water usage for baths													
31.9934	31.5183	30.8492	29.6155	28.6917	27.6674	27.1141	27.7785	28.5019	29.5980	30.8571	31.8853	31.8853	(42b)
Hot water usage for other uses													
45.1033	43.4632	41.8231	40.1829	38.5428	36.9027	36.9027	38.5428	40.1829	41.8231	43.4632	45.1033	45.1033	(42c)
Average daily hot water use (litres/day)												138.9940	(43)
Daily hot water use													
151.2079	147.9789	144.0467	138.0677	133.2122	127.9922	125.9863	129.9015	134.0307	139.5108	145.5819	150.8158	150.8158	(44)
Energy conte	239.4764	210.7200	221.3945	189.0077	179.3292	157.3813	152.3696	160.8452	165.2732	189.3148	207.4081	236.1411	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
35.9215	31.6080	33.2092	28.3512	26.8994	23.6072	22.8554	24.1268	24.7910	28.3972	31.1112	35.4212	35.4212	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6525	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8924	(55)
Total storage loss													
27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	(56)
If cylinder contains dedicated solar storage													
27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	(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													
290.4025	256.7177	272.3205	238.2910	230.2553	206.6646	203.2956	211.7713	214.5565	240.2409	256.6914	287.0672	287.0672	(62)
WWHRS	-33.8805	-29.9642	-31.3768	-25.9812	-24.2136	-20.7197	-19.4214	-20.6528	-21.4374	-25.2724	-28.6305	-33.2531	(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													
256.5219	226.7535	240.9437	212.3098	206.0417	185.9449	183.8742	191.1186	193.1191	214.9685	228.0609	253.8141	253.8141	(64)
12Total per year (kWh/year)												2593.4709	(64)
Electric shower(s)												2593	(64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
120.3668	106.8626	114.3545	102.2717	100.3678	91.7559	91.4037	94.2219	94.3800	103.6880	108.3898	119.2578	119.2578	(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
----------------------------------	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

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(66)m	148.7809	148.7809	148.7809	148.7809	148.7809	148.7809	148.7809	148.7809	148.7809	148.7809	148.7809	148.7809	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	186.3996	206.3710	186.3996	192.6129	186.3996	192.6129	186.3996	186.3996	192.6129	186.3996	192.6129	186.3996	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	351.4669	355.1141	345.9234	326.3576	301.6593	278.4464	262.9388	259.2916	268.4823	288.0481	312.7464	335.9593	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.8781	37.8781	37.8781	37.8781	37.8781	37.8781	37.8781	37.8781	37.8781	37.8781	37.8781	37.8781	(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)	-119.0247	-119.0247	-119.0247	-119.0247	-119.0247	-119.0247	-119.0247	-119.0247	-119.0247	-119.0247	-119.0247	-119.0247	(71)
Water heating gains (Table 5)	161.7833	159.0217	153.7023	142.0440	134.9030	127.4388	122.8545	126.6423	131.0833	139.3656	150.5414	160.2927	(72)
Total internal gains	770.2841	791.1410	756.6596	731.6488	693.5962	666.1324	639.8271	639.9678	659.8128	684.4475	726.5350	753.2858	(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					11.6300	10.6334		0.6300	0.7000	0.7700		37.7940 (74)	
East					4.0500	19.6403		0.6300	0.7000	0.7700		24.3094 (76)	
West					12.0000	19.6403		0.6300	0.7000	0.7700		72.0278 (80)	
Solar gains	134.1313	260.6824	433.0905	649.7782	820.2903	852.1550	806.0517	674.9715	508.5234	309.5950	166.7450	110.7300	(83)
Total gains	904.4153	1051.8234	1189.7501	1381.4271	1513.8865	1518.2874	1445.8788	1314.9393	1168.3361	994.0426	893.2800	864.0159	(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)													
tau	98.4600	98.7375	99.0111	100.3165	100.5645	101.7357	101.7357	101.9555	101.2813	100.5645	100.0639	99.5459	
alpha	7.5640	7.5825	7.6007	7.6878	7.7043	7.7824	7.7824	7.7970	7.7521	7.7043	7.6709	7.6364	
util living area	1.0000	0.9998	0.9992	0.9923	0.9427	0.7643	0.5714	0.6503	0.9293	0.9976	0.9998	1.0000	(86)
MIT	20.0074	20.1222	20.3144	20.5999	20.8522	20.9795	20.9980	20.9950	20.9056	20.5792	20.2497	19.9957	(87)
Th 2	20.0131	20.0156	20.0181	20.0296	20.0318	20.0418	20.0418	20.0437	20.0380	20.0318	20.0274	20.0228	(88)
util rest of house	0.9999	0.9997	0.9987	0.9872	0.9060	0.6660	0.4491	0.5206	0.8689	0.9954	0.9997	1.0000	(89)
MIT 2	18.8436	18.9929	19.2411	19.6131	19.9123	20.0329	20.0415	20.0426	19.9775	19.5909	19.1658	18.8363	(90)
Living area fraction									fLA = Living area / (4) =			0.2088	(91)
MIT	19.0866	19.2287	19.4652	19.8191	20.1085	20.2305	20.2412	20.2414	20.1713	19.7972	19.3921	19.0783	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0866	19.2287	19.4652	19.8191	20.1085	20.2305	20.2412	20.2414	20.1713	19.7972	19.3921	19.0783	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9999	0.9996	0.9982	0.9856	0.9096	0.6866	0.4748	0.5481	0.8793	0.9946	0.9996	0.9999	(94)
Useful gains	904.3194	1051.4196	1187.6315	1361.5353	1377.0125	1042.4889	686.5235	720.7769	1027.3091	988.6450	892.9581	863.9531	(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	2885.3497	2788.1388	2515.8620	2091.2543	1606.4494	1063.3296	687.6345	723.8917	1151.7099	1757.1311	2360.1426	2871.5868	(97)
Space heating kWh	1473.8866	1167.0753	988.2035	525.3977	170.7010	0.0000	0.0000	0.0000	0.0000	571.7536	1056.3728	1493.6795	(98a)
Space heating requirement - total per year (kWh/year)												7447.0700	
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	1473.8866	1167.0753	988.2035	525.3977	170.7010	0.0000	0.0000	0.0000	0.0000	571.7536	1056.3728	1493.6795	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7447.0700	
Space heating per m2										(98c) / (4) =		41.4071	(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)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	1473.8866	1167.0753	988.2035	525.3977	170.7010	0.0000	0.0000	0.0000	0.0000	571.7536	1056.3728	1493.6795	(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)	1596.8435	1264.4369	1070.6430	569.2282	184.9415	0.0000	0.0000	0.0000	0.0000	619.4514	1144.4993	1618.2876	(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	256.5219	226.7535	240.9437	212.3098	206.0417	185.9449	183.8742	191.1186	193.1191	214.9685	228.0609	253.8141	(64)
Efficiency of water heater (217)m	87.3397	87.2001	86.8793	86.0083	83.6410	79.8000	79.8000	79.8000	79.8000	86.1452	87.0567	87.3688	(216)
Fuel for water heating, kWh/month	293.7058	260.0382	277.3317	246.8480	246.3407	233.0137	230.4188	239.4969	242.0039	249.5419	261.9683	290.5088	(219)
Space cooling fuel requirement													

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(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	7.0685	7.3041	7.0685	7.3041	7.0685	(231)
Lighting	38.7302	31.0708	27.9758	20.4963	15.8319	12.9348	14.4424	18.7728	24.3840	31.9931	36.1361	39.8066	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-76.7527	-104.3482	-144.6305	-156.5045	-163.6266	-150.7334	-148.6606	-142.6853	-131.6276	-116.1615	-82.9085	-66.8006	(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	-55.8889	-115.8802	-227.3674	-337.3949	-442.3612	-443.2953	-438.2619	-372.9331	-275.7180	-164.5476	-74.2068	-44.3425	(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												8068.3316	(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												3071.2167	(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)												312.5745	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-4477.6377	(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												7060.4850	(238)

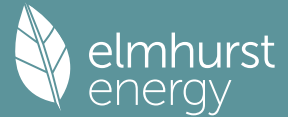
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	8068.3316	0.2100	1694.3496 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3071.2167	0.2100	644.9555 (264)
Space and water heating			2339.3051 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	312.5745	0.1443	45.1142 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1485.4399	0.1354	-201.1480
PV Unit electricity exported	-2992.1978	0.1262	-377.7519
Total			-578.8999 (269)
Total CO2, kg/year			1817.4486 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.1100 (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	8068.3316	1.1300	9117.2147 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3071.2167	1.1300	3470.4748 (278)
Space and water heating			12587.6895 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	312.5745	1.5338	479.4372 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1485.4399	1.5005	-2228.9172
PV Unit electricity exported	-2992.1978	0.4634	-1386.6539
Total			-3615.5710 (283)
Total Primary energy kWh/year			9581.6565 (286)
Target Primary Energy Rate (TPER)			53.2800 (287)

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Plot Reference	5B10P				Issued on Date	30/03/2026	
Assessment Reference	BeLean			Plot Type Ref			
Plot Address	Woodstock, Land West of Gatesmead, Haywards Heath, RH161SN				SAP Version	10.2	
SAP Rating	93 A	DER	8.16	TER	9.12		
Environmental	91 B	% DER < TER				10.53	
CO ₂ Emissions (t/year)	1.41	DFEE	37.29	TFEE	43.65		
Compliance Check	See BREL	% DFEE < TFEE				14.57	
% DPER < TPER	6.85	DPER	44.92	TPER	48.22		
Assessor Details	Mr. Mirza Baig				Assessor ID	CK52-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	107.3000 (1b)	x 2.7400 (2b)	= 294.0020 (1b) - (3b)
First floor	101.5000 (1c)	x 2.4600 (2c)	= 249.6900 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	208.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 543.6920 (5)

2. Ventilation rate

	m ³ 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)											
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	3.0000 (17)											
Infiltration rate	0.1500 (18)											
Number of sides sheltered	0 (19)											
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)											
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (21)											
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (22b)
Balanced mechanical ventilation with heat recovery												
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)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												71.2000 (23c)
Effective ac	0.3352	0.3315	0.3277	0.3090	0.3052	0.2865	0.2865	0.2827	0.2940	0.3052	0.3127	0.3202 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Front Door			2.1000	1.0000	2.1000		(26)
Window			36.9800	1.0536	38.9636		(27)
Heatloss Floor 1			107.3000	0.1000	10.7300	110.0000	11803.0000 (28a)
External Wall GF	224.2600	39.0800	185.1800	0.1600	29.6288	190.0000	35184.2000 (29a)
External Roof 1	101.5000		101.5000	0.1000	10.1500	9.0000	913.5000 (30)
Flat Roof	5.8000		5.8000	0.1000	0.5800	9.0000	52.2000 (30)
Total net area of external elements Aum(A, m ²)			438.8600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		92.1524		(33)
Main dwelling							
Internal Wall 1			374.7800			75.0000	28108.5000 (32c)
Internal Ceiling 1			101.5000			9.0000	913.5000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	76974.9000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							368.6537 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	44.0200	0.0560	2.4651
E6 Intermediate floor within a dwelling	32.5200	0.0050	0.1626
E10 Eaves (insulation at ceiling level)	42.2200	0.0500	2.1110
E12 Gable (insulation at ceiling level)	0.0000	0.0570	0.0000
E16 Corner (normal)	31.4500	0.0360	1.1322
E17 Corner (inverted - internal area greater than external area)	10.6700	-0.0900	-0.9603
E2 Other lintels (including other steel lintels)	25.6400	0.0620	1.5897
E3 Sill	16.6000	0.0390	0.6474
E4 Jamb	56.0000	0.0520	2.9120
E24 Eaves (insulation at ceiling level - inverted)	10.8200	0.0750	0.8115
E14 Flat roof	6.1900	0.0700	0.4333
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.3045 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	103.4569 (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	60.1500	59.4772	58.8044	55.4403	54.7675	51.4034	51.4034	50.7305	52.7490	54.7675	56.1131	57.4587	(38)
Heat transfer coeff	163.2656	162.9341	162.2613	158.8972	158.2244	154.8603	154.8603	154.1874	156.2059	158.2244	159.5700	160.9156	(39)
Average = Sum(39)m / 12 =												158.7290	
HLP	0.7836	0.7803	0.7771	0.7610	0.7578	0.7417	0.7417	0.7384	0.7481	0.7578	0.7642	0.7707	(40)
HLP (average)												0.7602	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.0134 (42)
Hot water usage for mixer showers	74.7441	73.6209	71.9841	68.8523	66.5412	63.9638	62.4988	64.1233	65.9039	68.6712	71.8702	74.4577	(42a)
Hot water usage for baths	32.2656	31.7864	31.1116	29.8674	28.9358	27.9027	27.3447	28.0148	28.7444	29.8498	31.1196	32.1566	(42b)
Hot water usage for other uses	45.4899	43.8357	42.1815	40.5274	38.8732	37.2190	37.2190	38.8732	40.5274	42.1815	43.8357	45.4899	(42c)
Average daily hot water use (litres/day)												140.1814	(43)
Daily hot water use	152.4997	149.2430	145.2772	139.2471	134.3501	129.0855	127.0626	131.0112	135.1757	140.7026	146.8256	152.1042	(44)
Energy conte	241.5222	212.5201	223.2857	190.6223	180.8611	158.7257	153.6712	162.2193	166.6851	190.9321	209.1800	238.1584	(45)
Energy content (annual)										Total = Sum(45)m =		2328.3832	
Distribution loss (46)m = 0.15 x (45)m	36.2283	31.8780	33.4929	28.5934	27.1292	23.8089	23.0507	24.3329	25.0028	28.6398	31.3770	35.7238	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8100	(55)
Total storage loss	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	(56)
If cylinder contains dedicated solar storage													
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	(57)
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	289.8946	256.2113	271.6581	237.4343	229.2335	205.5377	202.0436	210.5917	213.4971	239.3045	255.9920	286.5308	(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	289.8946	256.2113	271.6581	237.4343	229.2335	205.5377	202.0436	210.5917	213.4971	239.3045	255.9920	286.5308	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2897.9292	(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	119.0040	105.6159	112.9404	100.8315	98.8342	90.2259	89.7936	92.6358	92.8724	102.1828	107.0019	117.8856	(65)

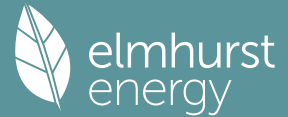
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	150.6683	150.6683	150.6683	150.6683	150.6683	150.6683	150.6683	150.6683	150.6683	150.6683	150.6683	150.6683	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	191.3303	211.8300	191.3303	197.7080	191.3303	197.7080	191.3303	191.3303	197.7080	191.3303	197.7080	191.3303	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	379.3338	383.2701	373.3508	352.2337	325.5771	300.5237	283.7865	279.8502	289.7695	310.8866	337.5432	362.5966	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.0668	38.0668	38.0668	38.0668	38.0668	38.0668	38.0668	38.0668	38.0668	38.0668	38.0668	38.0668	(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)	-120.5347	-120.5347	-120.5347	-120.5347	-120.5347	-120.5347	-120.5347	-120.5347	-120.5347	-120.5347	-120.5347	-120.5347	(71)
Water heating gains (Table 5)	159.9517	157.1665	151.8016	140.0438	132.8417	125.3138	120.6903	124.5105	128.9895	137.3425	148.6138	158.4484	(72)
Total internal gains	801.8163	823.4671	787.6832	761.1860	720.9497	691.7460	664.0076	663.8916	684.6675	710.7600	755.0655	783.5758	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	2.9400	11.2829	0.4000	1.0000	0.7700	9.1952 (75)
Southwest	18.0900	36.7938	0.4000	1.0000	0.7700	184.5044 (79)

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Northwest	15.9500				11.2829		0.4000		1.0000		0.7700		49.8857 (81)
Solar gains	243.5854	434.5403	646.6827	888.6418	1075.1007	1102.4046	1048.2376	903.7681	729.6289	494.3141	295.3329	206.1458	(83)
Total gains	1045.4017	1258.0074	1434.3660	1649.8278	1796.0504	1794.1506	1712.2452	1567.6596	1414.2964	1205.0741	1050.3984	989.7217	(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	130.6908	131.2305	131.7746	134.5645	135.1367	138.0723	138.0723	138.6748	136.8829	135.1367	133.9971	132.8766	
alpha	9.7127	9.7487	9.7850	9.9710	10.0091	10.2048	10.2048	10.2450	10.1255	10.0091	9.9331	9.8584	
util living area	0.9999	0.9996	0.9969	0.9621	0.7966	0.5518	0.3979	0.4524	0.7499	0.9878	0.9997	1.0000	(86)
MIT	20.3381	20.4639	20.6376	20.8680	20.9840	20.9996	21.0000	21.0000	20.9932	20.8207	20.5405	20.3264	(87)
Th 2	20.6082	20.6098	20.6114	20.6195	20.6211	20.6292	20.6292	20.6308	20.6259	20.6211	20.6179	20.6147	(88)
util rest of house	0.9999	0.9995	0.9961	0.9536	0.7697	0.5201	0.3644	0.4161	0.7133	0.9838	0.9996	1.0000	(89)
MIT 2	19.9715	20.0986	20.2733	20.5058	20.6096	20.6289	20.6292	20.6308	20.6218	20.4636	20.1823	19.9654	(90)
Living area fraction	fLA = Living area / (4) = 0.1798 (91)												
MIT	20.0374	20.1643	20.3388	20.5709	20.6769	20.6956	20.6958	20.6972	20.6886	20.5278	20.2467	20.0303	(92)
Temperature adjustment	0.0000												
adjusted MIT	20.0374	20.1643	20.3388	20.5709	20.6769	20.6956	20.6958	20.6972	20.6886	20.5278	20.2467	20.0303	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9999	0.9994	0.9955	0.9524	0.7737	0.5258	0.3704	0.4226	0.7195	0.9827	0.9995	0.9999	(94)
Useful gains	1045.3038	1257.1980	1427.8614	1571.3256	1389.6884	943.3278	634.2684	662.5108	1017.6233	1184.1806	1049.8541	989.6674	(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	2574.7505	2487.0772	2245.5084	1854.4771	1420.3718	943.9658	634.2843	662.5671	1029.1718	1570.8235	2097.8262	2547.3500	(97)
Space heating kWh	1137.9084	826.4788	608.3294	203.8691	22.8284	0.0000	0.0000	0.0000	0.0000	287.6623	754.5399	1158.9158	(98a)
Space heating requirement - total per year (kWh/year)	5000.5322												
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	1137.9084	826.4788	608.3294	203.8691	22.8284	0.0000	0.0000	0.0000	0.0000	287.6623	754.5399	1158.9158	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)	5000.5322												
Space heating per m2	(98c) / (4) = 23.9489 (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 %)													88.8000 (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	1137.9084	826.4788	608.3294	203.8691	22.8284	0.0000	0.0000	0.0000	0.0000	287.6623	754.5399	1158.9158	(98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000	(210)
Space heating fuel (main heating system)	1281.4283	930.7194	685.0556	229.5823	25.7077	0.0000	0.0000	0.0000	0.0000	323.9441	849.7071	1305.0854	(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	289.8946	256.2113	271.6581	237.4343	229.2335	205.5377	202.0436	210.5917	213.4971	239.3045	255.9920	286.5308	(64)
Efficiency of water heater (217)m	86.8121	86.4916	85.8123	83.7199	80.5393	79.8000	79.8000	79.8000	79.8000	84.4736	86.3334	86.8581	(216)
Fuel for water heating, kWh/month	333.9333	296.2267	316.5724	283.6057	284.6233	257.5661	253.1874	263.8994	267.5403	283.2891	296.5155	329.8837	(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	65.6676	59.3127	65.6676	63.5493	65.6676	63.5493	65.6676	65.6676	63.5493	65.6676	63.5493	65.6676	(221)
Lighting	46.7564	37.5097	33.7733	24.7438	19.1128	15.6153	17.4353	22.6631	29.4371	38.6231	43.6247	48.0559	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-61.1753	-85.5335	-121.5320	-136.2675	-147.9549	-138.8691	-137.7634	-130.0037	-116.5270	-98.2685	-67.3666	-53.1416	(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	-31.1644	-63.3094	-119.5196	-171.1683	-220.0874	-218.5943	-216.7946	-187.2814	-142.9394	-88.4802	-41.0913	-24.8727	(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	5631.2300 (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	3466.8429 (219)												
Space cooling fuel	0.0000 (221)												

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Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.0360)		
mechanical ventilation fans (SFP = 1.0360)		687.1832 (230a)
central heating pump		41.0000 (230c)
main heating flue fan		45.0000 (230e)
Total electricity for the above, kWh/year		773.1832 (231)
Electricity for lighting (calculated in Appendix L)		377.3506 (232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation		-2819.7061 (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		7428.9005 (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	5631.2300	0.2100	1182.5583 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3466.8429	0.2100	728.0370 (264)
Space and water heating			1910.5953 (265)
Pumps, fans and electric keep-hot	773.1832	0.1387	107.2500 (267)
Energy for lighting	377.3506	0.1443	54.4634 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1294.4031	0.1346	-174.1993
PV Unit electricity exported	-1525.3029	0.1272	-193.9442
Total			-368.1435 (269)
Total CO2, kg/year			1704.1652 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			8.1600 (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	5631.2300	1.1300	6363.2899 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3466.8429	1.1300	3917.5324 (278)
Space and water heating			10280.8223 (279)
Pumps, fans and electric keep-hot	773.1832	1.5128	1169.6715 (281)
Energy for lighting	377.3506	1.5338	578.7929 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1294.4031	1.4974	-1938.2099
PV Unit electricity exported	-1525.3029	0.4668	-711.9947
Total			-2650.2046 (283)
Total Primary energy kWh/year			9379.0821 (286)
Dwelling Primary energy Rate (DPER)			44.9200 (287)

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

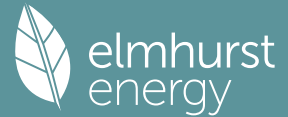
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	107.3000 (1b)	x 2.7400 (2b)	= 294.0020 (1b) - (3b)
First floor	101.5000 (1c)	x 2.4600 (2c)	= 249.6900 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	208.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	543.6920 (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	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.0736 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3236 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3236 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000	(22)
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													
Effective ac	0.4126	0.4045	0.3964	0.3559	0.3478	0.3074	0.3074	0.2993	0.3236	0.3478	0.3640	0.3802	(22b)
	0.5851	0.5818	0.5786	0.5633	0.5605	0.5472	0.5472	0.5448	0.5523	0.5605	0.5663	0.5723	(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			2.1000	1.0000	2.1000		(26)
TER Opening Type			36.9800	1.1450	42.3435		(27)
Heatloss Floor 1			107.3000	0.1300	13.9490		(28a)
External Wall GF	224.2600	39.0800	185.1800	0.1800	33.3324		(29a)
External Roof 1	101.5000		101.5000	0.1100	11.1650		(30)
Flat Roof	5.8000		5.8000	0.1100	0.6380		(30)
Total net area of external elements Aum(A, m2)			438.8600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	103.5279	(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K

368.6537 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	44.0200	0.1600	7.0432
E6 Intermediate floor within a dwelling	32.5200	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	42.2200	0.0600	2.5332
E12 Gable (insulation at ceiling level)	0.0000	0.0600	0.0000
E16 Corner (normal)	31.4500	0.0900	2.8305
E17 Corner (inverted - internal area greater than external area)	10.6700	-0.0900	-0.9603
E2 Other lintels (including other steel lintels)	25.6400	0.0500	1.2820
E3 Sill	16.6000	0.0500	0.8300
E4 Jamb	56.0000	0.0500	2.8000
E24 Eaves (insulation at ceiling level - inverted)	10.8200	0.2400	2.5968
E14 Flat roof	6.1900	0.0800	0.4952

Thermal bridges (Sum(L x Psi) calculated using Appendix K)

19.4506 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 122.9785 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	104.9777	104.3848	103.8036	101.0740	100.5633	98.1858	98.1858	97.7455	99.1016	100.5633	101.5964	102.6766	(38)
Average = Sum(39)m / 12 =	227.9562	227.3633	226.7822	224.0525	223.5418	221.1643	221.1643	220.7241	222.0801	223.5418	224.5749	225.6551	(39)
												224.0500	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0917	1.0889	1.0861	1.0730	1.0706	1.0592	1.0592	1.0571	1.0636	1.0706	1.0756	1.0807	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

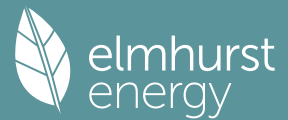
4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.0134	(42)
Hot water usage for mixer showers														
74.7441	73.6209	71.9841	68.8523	66.5412	63.9638	62.4988	64.1233	65.9039	68.6712	71.8702	74.4577		(42a)	
Hot water usage for baths														
32.2656	31.7864	31.1116	29.8674	28.9358	27.9027	27.3447	28.0148	28.7444	29.8498	31.1196	32.1566		(42b)	
Hot water usage for other uses														
45.4899	43.8357	42.1815	40.5274	38.8732	37.2190	37.2190	38.8732	40.5274	42.1815	43.8357	45.4899		(42c)	
Average daily hot water use (litres/day)													140.1814	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use														
152.4997	149.2430	145.2772	139.2471	134.3501	129.0855	127.0626	131.0112	135.1757	140.7026	146.8256	152.1042		(44)	
Energy content (annual)	241.5222	212.5201	223.2857	190.6223	180.8611	158.7257	153.6712	162.2193	166.6851	190.9321	209.1800	238.1584	(45)	
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2328.3832		
36.2283	31.8780	33.4929	28.5934	27.1292	23.8089	23.0507	24.3329	25.0028	28.6398	31.3770	35.7238	(46)		
Water storage loss (or HIU loss):														
Store volume												200.0000	(47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.6525	(48)	
Temperature factor from Table 2b												0.5400	(49)	
Enter (49) or (54) in (55)												0.8924	(55)	
Total storage loss														
27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(56)		
If cylinder contains dedicated solar storage														
27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(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														
292.4482	258.5178	274.2118	239.9056	231.7872	208.0090	204.5972	213.1454	215.9684	241.8581	258.4633	289.0845	(62)		
WWHRS	-34.1699	-30.2201	-31.6448	-26.2031	-24.4204	-20.8967	-19.5873	-20.8291	-21.6205	-25.4882	-28.8750	-33.5371	(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														
258.2784	228.2977	242.5670	213.7025	207.3668	187.1123	185.0099	192.3162	194.3479	216.3699	229.5882	255.5474	(64)		
12Total per year (kWh/year)												2610.5043	(64)	
Electric shower(s)								Total per year (kWh/year) = Sum(64)m =				2611	(64)	
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														
121.0470	107.4611	114.9834	102.8086	100.8772	92.2029	91.8365	94.6788	94.8494	104.2258	108.9790	119.9285	(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
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(66)m	150.6683	150.6683	150.6683	150.6683	150.6683	150.6683	150.6683	150.6683	150.6683	150.6683	150.6683	150.6683	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	195.9330	216.9258	195.9330	202.4641	195.9330	202.4641	195.9330	195.9330	202.4641	195.9330	202.4641	195.9330	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	379.3338	383.2701	373.3508	352.2337	325.5771	300.5237	283.7865	279.8502	289.7695	310.8866	337.5432	362.5966	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.0668	38.0668	38.0668	38.0668	38.0668	38.0668	38.0668	38.0668	38.0668	38.0668	38.0668	38.0668	(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)	-120.5347	-120.5347	-120.5347	-120.5347	-120.5347	-120.5347	-120.5347	-120.5347	-120.5347	-120.5347	-120.5347	-120.5347	(71)
Water heating gains (Table 5)	162.6976	159.9124	154.5475	142.7897	135.5876	128.0596	123.4362	127.2564	131.7353	140.0884	151.3597	161.1943	(72)
Total internal gains	809.1649	831.3088	795.0318	768.6879	728.2982	699.2479	671.3562	671.2401	692.1695	718.1085	762.5675	790.9244	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	

Northeast					2.9400	11.2829	0.6300		0.7000		0.7700		10.1377 (75)	
Southwest					18.0900	36.7938	0.6300		0.7000		0.7700		203.4161 (79)	
Northwest					15.9500	11.2829	0.6300		0.7000		0.7700		54.9990 (81)	

Solar gains	268.5529	479.0807	712.9677	979.7276	1185.2986	1215.4010	1155.6820	996.4043	804.4159	544.9813	325.6046	227.2758	(83)	
Total gains	1077.7178	1310.3895	1507.9995	1748.4155	1913.5968	1914.6490	1827.0381	1667.6444	1496.5853	1263.0898	1088.1720	1018.2001	(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	93.7984	94.0430	94.2839	95.4326	95.6507	96.6789	96.6789	96.8717	96.2802	95.6507	95.2106	94.7549		
alpha	7.2532	7.2695	7.2856	7.3622	7.3767	7.4453	7.4453	7.4581	7.4187	7.3767	7.3474	7.3170		
util living area	0.9999	0.9996	0.9981	0.9856	0.9138	0.7172	0.5303	0.6029	0.8914	0.9949	0.9997	1.0000	(86)	
MIT	19.9732	20.1153	20.3286	20.6274	20.8754	20.9840	20.9984	20.9962	20.9251	20.5970	20.2332	19.9552	(87)	
Th 2	20.0076	20.0099	20.0122	20.0229	20.0249	20.0343	20.0343	20.0360	20.0307	20.0249	20.0209	20.0166	(88)	
util rest of house	0.9999	0.9994	0.9971	0.9768	0.8680	0.6203	0.4154	0.4802	0.8180	0.9907	0.9995	0.9999	(89)	
MIT 2	18.7992	18.9833	19.2582	19.6434	19.9281	20.0274	20.0340	20.0352	19.9856	19.6107	19.1432	18.7833	(90)	
Living area fraction									fLA = Living area / (4) =			0.1798	(91)	
MIT	19.0103	19.1868	19.4507	19.8203	20.0984	20.1994	20.2074	20.2080	20.1546	19.7881	19.3392	18.9940	(92)	
Temperature adjustment												0.0000		
adjusted MIT	19.0103	19.1868	19.4507	19.8203	20.0984	20.1994	20.2074	20.2080	20.1546	19.7881	19.3392	18.9940	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	0.9998	0.9992	0.9962	0.9744	0.8720	0.6377	0.4362	0.5025	0.8291	0.9892	0.9993	0.9999	(94)	
Useful gains	1077.5234	1309.3247	1502.2704	1703.6825	1668.7425	1220.8887	796.8885	837.9906	1240.7462	1249.3870	1087.4454	1018.0809	(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	3353.3078	3248.3021	2936.9803	2446.7304	1877.4033	1238.3914	797.8303	840.5148	1344.6037	2053.9199	2748.6216	3338.3471	(97)	
Space heating kWh	1693.1836	1302.9928	1067.4242	534.9945	155.2436	0.0000	0.0000	0.0000	0.0000	598.5725	1196.0469	1726.2781	(98a)	
Space heating requirement - total per year (kWh/year)												8274.7362		
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	1693.1836	1302.9928	1067.4242	534.9945	155.2436	0.0000	0.0000	0.0000	0.0000	598.5725	1196.0469	1726.2781	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												8274.7362		
Space heating per m2										(98c) / (4) =		39.6300	(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	1693.1836	1302.9928	1067.4242	534.9945	155.2436	0.0000	0.0000	0.0000	0.0000	598.5725	1196.0469	1726.2781	(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)	1834.4351	1411.6932	1156.4726	579.6257	168.1946	0.0000	0.0000	0.0000	0.0000	648.5075	1295.8254	1870.2904	(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	258.2784	228.2977	242.5670	213.7025	207.3668	187.1123	185.0099	192.3162	194.3479	216.3699	229.5882	255.5474	(64)	
Efficiency of water heater (217)m	87.4940	87.3316	86.9835	86.0305	83.4197	79.8000	79.8000	79.8000	79.8000	86.2183	87.2159	87.5271	(216)	
Fuel for water heating, kWh/month	295.1955	261.4149	278.8656	248.4031	248.5826	234.4766	231.8420	240.9978	243.5438	250.9560	263.2412	291.9637	(217)	
Space cooling fuel requirement														

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(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	7.0685	7.3041	7.0685	7.3041	7.0685	(231)
Lighting	40.7110	32.6599	29.4066	21.5445	16.6416	13.5963	15.1810	19.7329	25.6311	33.6294	37.9843	41.8425	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-88.3593	-118.8969	-163.1257	-174.6601	-181.0835	-166.2411	-163.8924	-157.9972	-146.9291	-131.3642	-94.9701	-77.0480	(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	-68.7490	-141.9542	-277.4900	-410.3427	-536.6831	-537.3606	-531.2923	-452.7309	-335.5544	-201.1238	-91.1264	-54.5962	(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												8965.0446	(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												3089.4826	(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)												328.5611	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-5303.5713	(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												7165.5170	(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	8965.0446	0.2100	1882.6594 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3089.4826	0.2100	648.7913 (264)
Space and water heating			2531.4507 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	328.5611	0.1443	47.4215 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1664.5677	0.1356	-225.7906
PV Unit electricity exported	-3639.0037	0.1263	-459.7864
Total			-685.5770 (269)
Total CO2, kg/year			1905.2245 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.1200 (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	8965.0446	1.1300	10130.5004 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3089.4826	1.1300	3491.1153 (278)
Space and water heating			13621.6157 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	328.5611	1.5338	503.9580 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1664.5677	1.5014	-2499.1489
PV Unit electricity exported	-3639.0037	0.4638	-1687.8027
Total			-4186.9516 (283)
Total Primary energy kWh/year			10068.7230 (286)
Target Primary Energy Rate (TPER)			48.2200 (287)

APPENDIX C

SAP Worksheets – Be Green Case

Full SAP Calculation Printout



Plot Reference	1B2P Mas			Issued on Date	08/04/2026
Assessment Reference	BeGreen	Plot Type Ref			
Plot Address	Itchen, Land West of Gatesmead, Haywards Heath, RH161SN			SAP Version	10.2
SAP Rating	88 B	DER	3.59	TER	15.04
Environmental	98 A	% DER < TER			76.13
CO ₂ Emissions (t/year)	0.17	DFEE	33.69	TFEE	43.94
Compliance Check	See BREL	% DFEE < TFEE			23.33
% DPER < TPER	52.33	DPER	37.74	TPER	79.18
Assessor Details	Mr. Mirza Baig			Assessor ID	CK52-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	50.6000 (1b)	2.4800 (2b)	125.4880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	125.4880 (5)

2. Ventilation rate

	m ³ 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)

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	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	0	(19)

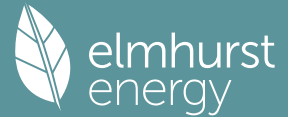
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1500 (21)

	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)
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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (22b)
Balanced mechanical ventilation with heat recovery												
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)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												73.6000 (23c)
Effective ac	0.3232	0.3195	0.3157	0.2970	0.2932	0.2745	0.2745	0.2707	0.2820	0.2932	0.3007	0.3082 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			10.0000	1.0536	10.5364		(27)
Heatloss Floor 1			50.4600	0.1000	5.0460	110.0000	5550.6000 (28a)
External Wall GF	77.6700	10.0000	67.6700	0.1600	10.8272	190.0000	12857.2997 (29a)
Total net area of external elements Aum(A, m ²)			128.1300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.4096		(33)
Main dwelling							
Party Ceiling 1			50.4600			30.0000	1513.8000 (32b)
Internal Wall 1			90.2300			75.0000	6767.2503 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	26688.9499 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							527.4496 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E5 Ground floor (normal)				31.3800	0.0560	1.7573	
E6 Intermediate floor within a dwelling				31.3800	0.0050	0.1569	

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E16 Corner (normal)						14.8500	0.0360	0.5346				
E17 Corner (inverted - internal area greater than external area)						4.9500	-0.0450	-0.2228				
E2 Other lintels (including other steel lintels)						7.0000	0.0620	0.4340				
E3 Sill						6.0000	0.0390	0.2340				
E4 Jamb						14.6000	0.0520	0.7592				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											3.6532	(36)
Point Thermal bridges											0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	30.0628 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	13.3861	13.2308	13.0755	12.2991	12.1438	11.3673	11.3673	11.2120	11.6779	12.1438	12.4544	12.7650 (38)
Average = Sum(39)m / 12 =	43.4489	43.2937	43.1384	42.3619	42.2066	41.4302	41.4302	41.2749	41.7407	42.2066	42.5172	42.8278 (39)
												42.3231
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8587	0.8556	0.8525	0.8372	0.8341	0.8188	0.8188	0.8157	0.8249	0.8341	0.8403	0.8464 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												1.7078 (42)
Hot water usage for mixer showers												
	52.8533	52.0590	50.9016	48.6871	47.0528	45.2303	44.1944	45.3430	46.6022	48.5590	50.8211	52.6508 (42a)
Hot water usage for baths												
	22.8519	22.5125	22.0346	21.1534	20.4935	19.7619	19.3667	19.8413	20.3580	21.1409	22.0402	22.7746 (42b)
Hot water usage for other uses												
	32.1193	30.9514	29.7834	28.6154	27.4474	26.2795	26.2795	27.4474	28.6154	29.7834	30.9514	32.1193 (42c)
Average daily hot water use (litres/day)												99.1157 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	107.8245	105.5229	102.7196	98.4559	94.9938	91.2716	89.8405	92.6317	95.5756	99.4833	103.8127	107.5448 (44)
Energy conte	170.7677	150.2632	157.8761	134.7811	127.8799	112.2291	108.6543	114.6974	117.8543	134.9979	147.9002	168.3891 (45)
Energy content (annual)												Total = Sum(45)m = 1646.2904
Distribution loss (46)m = 0.15 x (45)m												
	25.6152	22.5395	23.6814	20.2172	19.1820	16.8344	16.2981	17.2046	17.6781	20.2497	22.1850	25.2584 (46)
Water storage loss (or HIU 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	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	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												
	216.1269	191.2328	203.2353	178.6771	173.2391	156.1251	154.0135	160.0566	161.7503	180.3571	191.7962	213.7483 (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												
	216.1269	191.2328	203.2353	178.6771	173.2391	156.1251	154.0135	160.0566	161.7503	180.3571	191.7962	213.7483 (64)
												2180.3584 (64)
												2180 (64)
12Total per year (kWh/year)												
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)
												0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												
Heat gains from water heating, kWh/month												
	93.0676	82.7382	88.7812	79.9315	78.8074	72.4330	72.4149	74.4243	74.3033	81.1742	84.2936	92.2767 (65)

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

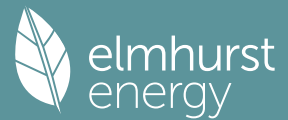
Metabolic gains (Table 5), Watts												
(66)m	85.3889	85.3889	85.3889	85.3889	85.3889	85.3889	85.3889	85.3889	85.3889	85.3889	85.3889	85.3889 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	75.0486	83.0895	75.0486	77.5502	75.0486	77.5502	75.0486	75.0486	77.5502	75.0486	77.5502	75.0486 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	148.7922	150.3362	146.4453	138.1622	127.7063	117.8792	111.3141	109.7701	113.6609	121.9440	132.4000	142.2271 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	31.5389	31.5389	31.5389	31.5389	31.5389	31.5389	31.5389	31.5389	31.5389	31.5389	31.5389	31.5389 (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)												
	-68.3111	-68.3111	-68.3111	-68.3111	-68.3111	-68.3111	-68.3111	-68.3111	-68.3111	-68.3111	-68.3111	-68.3111 (71)
Water heating gains (Table 5)												
	125.0909	123.1223	119.3295	111.0160	105.9240	100.6014	97.3319	100.0326	103.1991	109.1051	117.0745	124.0279 (72)
Total internal gains												
	397.5483	405.1646	389.4401	375.3451	357.2955	344.6474	332.3112	333.4679	343.0269	354.7143	375.6413	389.9202 (73)

6. Solar gains												

[Jan]												
			Area	Solar flux	g	FF						Gains
			m2	Table 6a	Specific data	Specific data						W
				W/m2	or Table 6b	or Table 6c				Access		
										factor		
										Table 6d		
North			1.5600	10.6334	0.4000	1.0000				0.7700		4.5982 (74)
East			6.8800	19.6403	0.4000	1.0000				0.7700		37.4567 (76)
West			1.5600	19.6403	0.4000	1.0000				0.7700		8.4931 (80)

Solar gains	50.5480	98.6749	162.9638	239.8801	296.8975	305.4412	290.1556	247.1206	190.1202	117.1193	62.9664	41.6201 (83)
Total gains	448.0962	503.8395	552.4039	615.2252	654.1930	650.0866	622.4668	580.5885	533.1470	471.8336	438.6077	431.5403 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	170.6278	171.2398	171.8562	175.0062	175.6501	178.9420	178.9420	179.6153	177.6106	175.6501	174.3670	173.1025
alpha	12.3752	12.4160	12.4571	12.6671	12.7100	12.9295	12.9295	12.9744	12.8407	12.7100	12.6245	12.5402
util living area	0.9990	0.9950	0.9694	0.8182	0.5996	0.4079	0.2929	0.3270	0.5401	0.8891	0.9939	0.9993 (86)
Living	20.7327	20.8044	20.8965	20.9673	20.9752	20.9758	20.9758	20.9759	20.9756	20.9585	20.8400	20.7237
Non living	19.9654	20.0383	20.1264	20.1925	20.1992	20.2129	20.2129	20.2157	20.2075	20.1909	20.0858	19.9662
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.8633	20.8044	20.8965	20.9673	20.9752	20.9758	20.9758	20.9759	20.9756	20.9585	20.8400	20.7624 (87)
Th 2	20.2028	20.2054	20.2080	20.2212	20.2239	20.2371	20.2371	20.2397	20.2318	20.2239	20.2186	20.2133 (88)
util rest of house	0.9983	0.9918	0.9530	0.7720	0.5498	0.3593	0.2421	0.2730	0.4800	0.8404	0.9893	0.9989 (89)
MIT 2	20.0813	20.0383	20.1264	20.1925	20.1992	20.2129	20.2129	20.2157	20.2075	20.1909	20.0858	20.0008 (90)
Living area fraction									fLA = Living area / (4) =			0.4668 (91)
MIT	20.4463	20.3959	20.4859	20.5542	20.5615	20.5691	20.5691	20.5706	20.5660	20.5492	20.4378	20.3563 (92)
Temperature adjustment												0.0000
adjusted MIT	20.4463	20.3959	20.4859	20.5542	20.5615	20.5691	20.5691	20.5706	20.5660	20.5492	20.4378	20.3563 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9986	0.9927	0.9595	0.7922	0.5715	0.3804	0.2642	0.2965	0.5062	0.8621	0.9909	0.9990 (94)
Useful gains	447.4637	500.1754	530.0310	487.3770	373.8807	247.2986	164.4389	172.1392	269.8763	406.7564	434.6081	431.1038 (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	701.5409	670.8741	603.3285	493.6928	374.0121	247.2992	164.4389	172.1392	269.8976	419.9211	567.0875	691.9388 (97)
Space heating kWh	189.0335	114.7096	54.5333	4.5474	0.0978	0.0000	0.0000	0.0000	0.0000	9.7946	95.3851	194.0612 (98a)
Space heating requirement - total per year (kWh/year)												662.1625
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	189.0335	114.7096	54.5333	4.5474	0.0978	0.0000	0.0000	0.0000	0.0000	9.7946	95.3851	194.0612 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												662.1625
Space heating per m2										(98c) / (4) =		13.0862 (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 %)												347.1849 (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	189.0335	114.7096	54.5333	4.5474	0.0978	0.0000	0.0000	0.0000	0.0000	9.7946	95.3851	194.0612 (98)
Space heating efficiency (main heating system 1)	347.1849	347.1849	347.1849	347.1849	347.1849	0.0000	0.0000	0.0000	0.0000	347.1849	347.1849	347.1849 (210)
Space heating fuel (main heating system)	54.4475	33.0399	15.7073	1.3098	0.0282	0.0000	0.0000	0.0000	0.0000	2.8211	27.4739	55.8956 (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	216.1269	191.2328	203.2353	178.6771	173.2391	156.1251	154.0135	160.0566	161.7503	180.3571	191.7962	213.7483 (64)
Efficiency of water heater	178.2000	178.2000	178.2000	178.2000	178.2000	178.2000	178.2000	178.2000	178.2000	178.2000	178.2000	178.2000 (216)
Fuel for water heating, kWh/month	121.2833	107.3136	114.0490	100.2678	97.2161	87.6123	86.4273	89.8185	90.7689	101.2105	107.6298	119.9485 (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	9.4659	8.5499	9.4659	9.1606	9.4659	9.1606	9.4659	9.4659	9.1606	9.4659	9.1606	9.4659 (231)
Lighting	15.9548	12.7996	11.5246	8.4434	6.5219	5.3285	5.9495	7.7334	10.0449	13.1795	14.8862	16.3983 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-15.9551	-24.2661	-37.4465	-45.1038	-51.7878	-49.5460	-48.9177	-44.7495	-37.6238	-28.8026	-18.0781	-13.5930 (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												190.7233 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												178.2000
Water heating fuel used												1223.5457 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7280)												
mechanical ventilation fans (SFP = 0.7280)												111.4534 (230a)

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Total electricity for the above, kWh/year	111.4534 (231)
Electricity for lighting (calculated in Appendix L)	128.7646 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-415.8699 (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	1238.6171 (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	190.7233	0.1594	30.3988 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1223.5457	0.1409	172.3684 (264)
Space and water heating			202.7672 (265)
Pumps, fans and electric keep-hot	111.4534	0.1387	15.4600 (267)
Energy for lighting	128.7646	0.1443	18.5847 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-415.8699	0.1331	-55.3384
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-55.3384 (269)
Total CO2, kg/year			181.4734 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.5900 (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	190.7233	1.5899	303.2362 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1223.5457	1.5209	1860.9001 (278)
Space and water heating			2164.1363 (279)
Pumps, fans and electric keep-hot	111.4534	1.5128	168.6067 (281)
Energy for lighting	128.7646	1.5338	197.5035 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-415.8699	1.4917	-620.3549
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-620.3549 (283)
Total Primary energy kWh/year			1909.8917 (286)
Dwelling Primary energy Rate (DPER)			37.7400 (287)

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

1. Overall dwelling characteristics

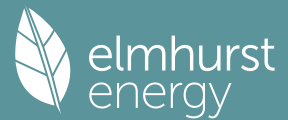
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	50.6000 (1b)	x 2.4800 (2b)	= 125.4880 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 125.4880 (5)

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)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 20.0000 / (5) = 0.1594 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4094 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.4094 (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												

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Effective ac	0.5220	0.5117	0.5015	0.4503	0.4401	0.3889	0.3889	0.3787	0.4094	0.4401	0.4606	0.4810 (22b)
	0.6362	0.6309	0.6257	0.6014	0.5968	0.5756	0.5756	0.5717	0.5838	0.5968	0.6061	0.6157 (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 Opening Type			10.0000	1.1450	11.4504		(27)
Heatloss Floor 1			50.4600	0.1300	6.5598		(28a)
External Wall GF	77.6700	10.0000	67.6700	0.1800	12.1806		(29a)
Total net area of external elements Aum(A, m2)			128.1300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.1908		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K

527.4496 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	31.3800	0.1600	5.0208
E6 Intermediate floor within a dwelling	31.3800	0.0000	0.0000
E16 Corner (normal)	14.8500	0.0900	1.3365
E17 Corner (inverted - internal area greater than external area)	4.9500	-0.0900	-0.4455
E2 Other lintels (including other steel lintels)	7.0000	0.0500	0.3500
E3 Sill	6.0000	0.0500	0.3000
E4 Jamb	14.6000	0.0500	0.7300

Thermal bridges (Sum(L x Psi) calculated using Appendix K)

7.2918 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 37.4826 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	26.3465	26.1275	25.9128	24.9043	24.7156	23.8372	23.8372	23.6746	24.1756	24.7156	25.0973	25.4963 (38)
Average = Sum(39)m / 12 =	63.8291	63.6100	63.3953	62.3869	62.1982	61.3198	61.3198	61.1572	61.6581	62.1982	62.5799	62.9789 (39)

Days in mont

62.3859

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2614	1.2571	1.2529	1.2329	1.2292	1.2119	1.2119	1.2086	1.2185	1.2292	1.2368	1.2446 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

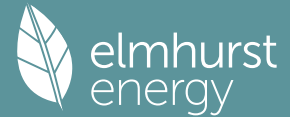
Assumed occupancy												1.7078 (42)
Hot water usage for mixer showers												
Hot water usage for baths												
Hot water usage for other uses												
Average daily hot water use (litres/day)												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	107.8245	105.5229	102.7196	98.4559	94.9938	91.2716	89.8405	92.6317	95.5756	99.4833	103.8127	107.5448 (44)
Energy conte	170.7677	150.2632	157.8761	134.7811	127.8799	112.2291	108.6543	114.6974	117.8543	134.9979	147.9002	168.3891 (45)
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m	25.6152	22.5395	23.6814	20.2172	19.1820	16.8344	16.2981	17.2046	17.6781	20.2497	22.1850	25.2584 (46)
Water storage loss (or HIU 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	217.3626	192.3489	204.4710	179.8730	174.4748	157.3210	155.2492	161.2923	162.9461	181.5928	192.9921	214.9840 (62)
WWHRS	-24.1623	-21.3694	-22.3768	-18.5288	-17.2682	-14.7765	-13.8506	-14.7288	-15.2884	-18.0233	-20.4182	-23.7149 (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	193.2003	170.9795	182.0943	161.3441	157.2066	142.5444	141.3986	146.5636	147.6577	163.5695	172.5739	191.2691 (64)
12Total per year (kWh/year)												1970.4016 (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	94.0562	83.6311	89.7697	80.8882	79.7960	73.3897	73.4035	75.4128	75.2600	82.1627	85.2503	93.2653 (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	85.3889	85.3889	85.3889	85.3889	85.3889	85.3889	85.3889	85.3889	85.3889	85.3889	85.3889	85.3889 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	75.6747	83.7827	75.6747	78.1972	75.6747	78.1972	75.6747	75.6747	78.1972	75.6747	78.1972	75.6747 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	148.7922	150.3362	146.4453	138.1622	127.7063	117.8792	111.3141	109.7701	113.6609	121.9440	132.4000	142.2271 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5389	31.5389	31.5389	31.5389	31.5389	31.5389	31.5389	31.5389	31.5389	31.5389	31.5389	31.5389 (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)	-68.3111	-68.3111	-68.3111	-68.3111	-68.3111	-68.3111	-68.3111	-68.3111	-68.3111	-68.3111	-68.3111	-68.3111 (71)
Water heating gains (Table 5)	126.4196	124.4510	120.6582	112.3447	107.2527	101.9301	98.6606	101.3613	104.5278	110.4338	118.4032	125.3566 (72)
Total internal gains												

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402.5031 410.1866 394.3950 380.3208 362.2504 346.6232 334.2661 335.4228 345.0026 359.6692 380.6170 394.8750 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				1.5600	10.6334	0.6300	0.7000	0.7700	5.0695 (74)			
East				6.8800	19.6403	0.6300	0.7000	0.7700	41.2960 (76)			
West				1.5600	19.6403	0.6300	0.7000	0.7700	9.3636 (80)			
Solar gains	55.7291	108.7890	179.6676	264.4679	327.3295	336.7490	319.8966	272.4505	209.6075	129.1240	69.4205	45.8862 (83)
Total gains	458.2323	518.9756	574.0625	644.7887	689.5799	683.3721	654.1627	607.8733	554.6101	488.7932	450.0375	440.7612 (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	116.1476	116.5476	116.9423	118.8327	119.1932	120.9005	120.9005	121.2221	120.2371	119.1932	118.4662	117.7155
alpha	8.7432	8.7698	8.7962	8.9222	8.9462	9.0600	9.0600	9.0815	9.0158	8.9462	8.8977	8.8477
util living area	0.9996	0.9987	0.9940	0.9548	0.8049	0.5727	0.4124	0.4626	0.7495	0.9788	0.9986	0.9997 (86)
MIT	20.3214	20.4351	20.6105	20.8441	20.9738	20.9988	20.9999	20.9998	20.9891	20.8114	20.5295	20.3096 (87)
Th 2	19.8712	19.8746	19.8779	19.8937	19.8967	19.9105	19.9105	19.9131	19.9052	19.8967	19.8907	19.8845 (88)
util rest of house	0.9994	0.9978	0.9893	0.9247	0.7257	0.4762	0.3103	0.3534	0.6409	0.9576	0.9974	0.9996 (89)
MIT 2	19.1034	19.2516	19.4763	19.7649	19.8832	19.9102	19.9105	19.9131	19.9016	19.7384	19.3859	19.0993 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.6719	19.8040	20.0057	20.2687	20.3923	20.4184	20.4191	20.4204	20.4092	20.2393	19.9197	19.6643 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.6719	19.8040	20.0057	20.2687	20.3923	20.4184	20.4191	20.4204	20.4092	20.2393	19.9197	19.6643 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9993	0.9977	0.9900	0.9365	0.7629	0.5214	0.3580	0.4044	0.6926	0.9658	0.9974	0.9995 (94)
Useful gains	457.9182	517.7812	568.3289	603.8359	526.1099	356.3072	234.1705	245.8356	384.1290	472.0739	448.8807	440.5443 (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	981.1770	948.0464	856.1988	709.2582	540.6441	356.7805	234.1842	245.8750	389.0160	599.5446	802.2558	973.9225 (97)
Space heating kWh	389.3046	289.1382	214.1752	75.9041	10.8134	0.0000	0.0000	0.0000	0.0000	94.8382	254.4301	396.8334 (98a)
Space heating requirement - total per year (kWh/year)	1725.4372											
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	389.3046	289.1382	214.1752	75.9041	10.8134	0.0000	0.0000	0.0000	0.0000	94.8382	254.4301	396.8334 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1725.4372											
Space heating per m ²	(98c) / (4) = 34.0996 (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	389.3046	289.1382	214.1752	75.9041	10.8134	0.0000	0.0000	0.0000	0.0000	94.8382	254.4301	396.8334 (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)	421.7818	313.2591	232.0425	82.2363	11.7155	0.0000	0.0000	0.0000	0.0000	102.7500	275.6556	429.9386 (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	193.2003	170.9795	182.0943	161.3441	157.2066	142.5444	141.3986	146.5636	147.6577	163.5695	172.5739	191.2691 (64)
Efficiency of water heater	85.5981	85.2281	84.4246	82.4743	80.3239	79.8000	79.8000	79.8000	79.8000	82.8830	84.9289	79.8000 (216)
Fuel for water heating, kWh/month	225.7063	200.6140	215.6886	195.6296	195.7157	178.6271	177.1912	183.6636	185.0348	197.3499	203.1981	85.6580 (217)
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	15.7237	12.6141	11.3576	8.3211	6.4275	5.2513	5.8633	7.6214	9.8994	12.9886	14.6706	16.1607 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-24.1086	-34.2187	-49.5390	-56.1497	-60.9796	-57.1301	-56.4738	-53.1246	-47.2438	-39.3785	-26.6048	-20.8205 (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	-12.9355	-27.2867	-54.3527	-81.7866	-108.2608	-108.7704	-107.4421	-90.8774	-66.5198	-39.0180	-17.2744	-10.2196 (233b)

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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	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	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	0.0000	(235d)
Annual totals kWh/year														
Space heating fuel - main system 1													1869.3794	(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													2381.7128	(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)													126.8994	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-1250.5158	(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													3213.4757	(238)

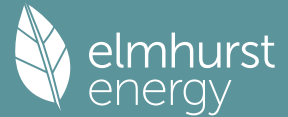
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1869.3794	0.2100	392.5697 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2381.7128	0.2100	500.1597 (264)
Space and water heating			892.7294 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	126.8994	0.1443	18.3155 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-525.7717	0.1344	-70.6673
PV Unit electricity exported	-724.7442	0.1259	-91.2108
Total			-161.8781 (269)
Total CO2, kg/year			761.0960 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.0400 (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	1869.3794	1.1300	2112.3987 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2381.7128	1.1300	2691.3354 (278)
Space and water heating			4803.7342 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	126.8994	1.5338	194.6425 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-525.7717	1.4967	-786.9407
PV Unit electricity exported	-724.7442	0.4620	-334.8057
Total			-1121.7464 (283)
Total Primary energy kWh/year			4006.7310 (286)
Target Primary Energy Rate (TPER)			79.1800 (287)

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Plot Reference	2B4P House				Issued on Date	08/04/2026	
Assessment Reference	BeGreen			Plot Type Ref			
Plot Address	Severn, Land West of Gatesmead, Haywards Heath, RH161SN				SAP Version	10.2	
SAP Rating	91 B	DER	2.39	TER	11.95		
Environmental	98 A	% DER < TER				80.00	
CO ₂ Emissions (t/year)	0.17	DFEE	33.85	TFEE	39.18		
Compliance Check	See BREL	% DFEE < TFEE				13.59	
% DPER < TPER	60.39	DPER	24.76	TPER	62.52		
Assessor Details	Mr. Mirza Baig				Assessor ID	CK52-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	39.8400 (1b)	x 2.7400 (2b)	= 109.1616 (1b) - (3b)
First floor	39.8400 (1c)	x 2.4600 (2c)	= 98.0064 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.6800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 207.1680 (5)

2. Ventilation rate

	m ³ 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)											
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	3.0000 (17)											
Infiltration rate	0.1500 (18)											
Number of sides sheltered	0 (19)											
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)											
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (21)											
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (22b)
Balanced mechanical ventilation with heat recovery												
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)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												73.6000 (23c)
Effective ac	0.3232	0.3195	0.3157	0.2970	0.2932	0.2745	0.2745	0.2707	0.2820	0.2932	0.3007	0.3082 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Front Door			2.2000	1.0000	2.2000		(26)
Window			10.6700	1.0536	11.2423		(27)
Heatloss Floor 1			39.8400	0.1000	3.9840	110.0000	4382.4000 (28a)
External Wall GF	92.8900	12.8700	80.0200	0.1600	12.8032	190.0000	15203.7999 (29a)
External Roof 1	39.8400		39.8400	0.1000	3.9840	9.0000	358.5600 (30)
Total net area of external elements Aum(A, m ²)			172.5700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.2135		(33)
Main dwelling							
Party Wall 1			43.9400	0.0000	0.0000	140.0000	6151.5998 (32)
Internal Wall 1			171.7400			75.0000	12880.5004 (32c)
Internal Ceiling 1			39.8400			9.0000	358.5600 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	39335.4201 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							493.6674 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	17.8800	0.0560	1.0013
E6 Intermediate floor within a dwelling	17.8800	0.0050	0.0894
E10 Eaves (insulation at ceiling level)	8.4600	0.0500	0.4230
E12 Gable (insulation at ceiling level)	9.4200	0.0570	0.5369
E16 Corner (normal)	10.3900	0.0360	0.3740
E18 Party wall between dwellings	10.3900	0.0390	0.4052
E2 Other lintels (including other steel lintels)	8.9000	0.0620	0.5518
E3 Sill	6.1000	0.0390	0.2379
E4 Jamb	17.5000	0.0520	0.9100
P1 Party wall - Ground floor	8.4600	0.3200	2.7072
P4 Party wall - Roof (insulation at ceiling level)	8.4600	0.0420	0.3553
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			7.5921 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	41.8056 (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	22.0991	21.8428	21.5864	20.3045	20.0482	18.7663	18.7663	18.5099	19.2791	20.0482	20.5609	21.0736	(38)
Heat transfer coeff	63.9048	63.6484	63.3920	62.1102	61.8538	60.5719	60.5719	60.3156	61.0847	61.8538	62.3665	62.8793	(39)
Average = Sum(39)m / 12 =												62.0461	
HLP	0.8020	0.7988	0.7956	0.7795	0.7763	0.7602	0.7602	0.7570	0.7666	0.7763	0.7827	0.7891	(40)
HLP (average)												0.7787	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.4568 (42)
Hot water usage for mixer showers	65.4115	64.4285	62.9961	60.2554	58.2328	55.9772	54.6952	56.1168	57.6751	60.0969	62.8965	65.1609	(42a)
Hot water usage for baths	28.2523	27.8327	27.2419	26.1524	25.3366	24.4321	23.9435	24.5302	25.1691	26.1370	27.2489	28.1568	(42b)
Hot water usage for other uses	39.7897	38.3428	36.8959	35.4490	34.0021	32.5552	32.5552	34.0021	35.4490	36.8959	38.3428	39.7897	(42c)
Average daily hot water use (litres/day)												122.6740	(43)
Daily hot water use	133.4535	130.6040	127.1338	121.8568	117.5715	112.9645	111.1939	114.6491	118.2932	123.1298	128.4881	133.1074	(44)
Energy conte	211.3578	185.9784	195.4000	166.8158	158.2739	138.9031	134.4794	141.9595	145.8673	167.0859	183.0549	208.4140	(45)
Energy content (annual)										Total = Sum(45)m =		2037.5900	
Distribution loss (46)m = 0.15 x (45)m	31.7037	27.8968	29.3100	25.0224	23.7411	20.8355	20.1719	21.2939	21.8801	25.0629	27.4582	31.2621	(46)
Water storage loss (or HIU 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	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	256.7170	226.9480	240.7592	210.7118	203.6331	182.7991	179.8386	187.3187	189.7633	212.4451	226.9509	253.7732	(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	256.7170	226.9480	240.7592	210.7118	203.6331	182.7991	179.8386	187.3187	189.7633	212.4451	226.9509	253.7732	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2571.6580	(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	106.5638	94.6135	101.2579	90.5831	88.9134	81.3021	81.0017	83.4889	83.6177	91.8434	95.9826	105.5850	(65)

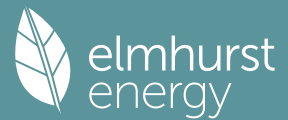
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	122.8381	122.8381	122.8381	122.8381	122.8381	122.8381	122.8381	122.8381	122.8381	122.8381	122.8381	122.8381	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	111.7055	123.6740	111.7055	115.4290	111.7055	115.4290	111.7055	111.7055	115.4290	111.7055	115.4290	111.7055	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	218.7704	221.0406	215.3199	203.1412	187.7677	173.3189	163.6661	161.3960	167.1167	179.2954	194.6688	209.1177	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2838	35.2838	35.2838	35.2838	35.2838	35.2838	35.2838	35.2838	35.2838	35.2838	35.2838	35.2838	(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)	-98.2705	-98.2705	-98.2705	-98.2705	-98.2705	-98.2705	-98.2705	-98.2705	-98.2705	-98.2705	-98.2705	-98.2705	(71)
Water heating gains (Table 5)	143.2309	140.7939	136.0993	125.8098	119.5073	112.9195	108.8733	112.2163	116.1357	123.4455	133.3091	141.9154	(72)
Total internal gains	533.5583	545.3599	522.9761	504.2314	478.8320	461.5189	444.0964	445.1692	458.5328	474.2978	503.2584	522.5900	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
East	3.6600	19.6403	0.4000	1.0000	0.7700	19.9261 (76)
West	7.0100	19.6403	0.4000	1.0000	0.7700	38.1644 (80)

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Solar gains	58.0905	113.6373	187.1445	272.9390	334.4970	342.4172	325.9952	280.0250	217.6567	134.8402	72.4320	47.7708 (83)
Total gains	591.6488	658.9972	710.1205	777.1705	813.3290	803.9361	770.0915	725.1942	676.1896	609.1380	575.6904	570.3608 (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	170.9811	171.6698	172.3641	175.9214	176.6505	180.3889	180.3889	181.1556	178.8747	176.6505	175.1982	173.7696	
alpha	12.3987	12.4447	12.4909	12.7281	12.7767	13.0259	13.0259	13.0770	12.9250	12.7767	12.6799	12.5846	
util living area	0.9997	0.9985	0.9907	0.9106	0.7048	0.4822	0.3461	0.3826	0.6228	0.9499	0.9981	0.9998 (86)	
Living	20.6936	20.7581	20.8474	20.9495	20.9744	20.9760	20.9760	20.9761	20.9756	20.9373	20.8023	20.6875	
Non living	19.9734	20.0402	20.1300	20.2312	20.2490	20.2640	20.2640	20.2669	20.2581	20.2266	20.0971	19.9776	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.8433	20.7581	20.8474	20.9495	20.9744	20.9760	20.9760	20.9761	20.9756	20.9373	20.8023	20.7312 (87)	
Th 2	20.2516	20.2544	20.2572	20.2711	20.2739	20.2880	20.2880	20.2908	20.2824	20.2739	20.2683	20.2627 (88)	
util rest of house	0.9995	0.9976	0.9848	0.8752	0.6511	0.4286	0.2901	0.3236	0.5584	0.9189	0.9967	0.9997 (89)	
MIT 2	20.1093	20.0402	20.1300	20.2312	20.2490	20.2640	20.2640	20.2669	20.2581	20.2266	20.0971	20.0175 (90)	
Living area fraction									FLA = Living area / (4) =				0.1958 (91)
MIT	20.2530	20.1807	20.2704	20.3718	20.3910	20.4034	20.4034	20.4058	20.3986	20.3657	20.2352	20.1572 (92)	
Temperature adjustment												0.0000	
adjusted MIT	20.2530	20.1807	20.2704	20.3718	20.3910	20.4034	20.4034	20.4058	20.3986	20.3657	20.2352	20.1572 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9995	0.9974	0.9849	0.8806	0.6598	0.4372	0.2992	0.3332	0.5688	0.9235	0.9966	0.9996 (94)
Useful gains	591.3569	657.3149	699.4077	684.3426	536.6522	351.5187	230.3791	241.6090	384.6352	562.5135	573.7213	570.1593 (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	1019.4718	972.5926	872.9359	712.5150	537.5738	351.5228	230.3791	241.6091	384.7486	604.0471	819.1959	1003.3787 (97)
Space heating kWh	318.5175	211.8667	129.1050	20.2841	0.6857	0.0000	0.0000	0.0000	0.0000	30.9010	176.7417	322.3152 (98a)
Space heating requirement - total per year (kWh/year)												1210.4168
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	318.5175	211.8667	129.1050	20.2841	0.6857	0.0000	0.0000	0.0000	0.0000	30.9010	176.7417	322.3152 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1210.4168
Space heating per m2										(98c) / (4) =		15.1910 (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 %)													372.2874 (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	318.5175	211.8667	129.1050	20.2841	0.6857	0.0000	0.0000	0.0000	0.0000	30.9010	176.7417	322.3152 (98)	
Space heating efficiency (main heating system 1)	372.2874	372.2874	372.2874	372.2874	372.2874	0.0000	0.0000	0.0000	0.0000	372.2874	372.2874	372.2874 (210)	
Space heating fuel (main heating system)	85.5569	56.9094	34.6788	5.4485	0.1842	0.0000	0.0000	0.0000	0.0000	8.3003	47.4745	86.5770 (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	256.7170	226.9480	240.7592	210.7118	203.6331	182.7991	179.8386	187.3187	189.7633	212.4451	226.9509	253.7732 (64)	
Efficiency of water heater (217)m	195.6322	195.6322	195.6322	195.6322	195.6322	195.6322	195.6322	195.6322	195.6322	195.6322	195.6322	195.6322 (216)	
Fuel for water heating, kWh/month	131.2243	116.0075	123.0673	107.7082	104.0898	93.4402	91.9269	95.7505	97.0001	108.5942	116.0090	129.7196 (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	16.5288	14.9293	16.5288	15.9956	16.5288	15.9956	16.5288	16.5288	15.9956	16.5288	15.9956	16.5288 (223)	
Lighting	21.5972	17.3261	15.6002	11.4294	8.8284	7.2129	8.0536	10.4683	13.5973	17.8404	20.1507	22.1975 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-30.3300	-45.2269	-68.3153	-79.8274	-89.7202	-85.2098	-84.0990	-77.7197	-66.4899	-52.5114	-33.9988	-25.9330 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	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)	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)	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)	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)	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)	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)	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													325.1297 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)

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Efficiency of water heater	195.6322	
Water heating fuel used	1314.5373	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7700)		
mechanical ventilation fans (SFP = 0.7700)	194.6136	(230a)
Total electricity for the above, kWh/year	194.6136	(231)
Electricity for lighting (calculated in Appendix L)	174.3020	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-739.3813	(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	1269.2014	(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	325.1297	0.1586	51.5701 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1314.5373	0.1410	185.3274 (264)
Space and water heating			236.8975 (265)
Pumps, fans and electric keep-hot	194.6136	0.1387	26.9953 (267)
Energy for lighting	174.3020	0.1443	25.1572 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-739.3813	0.1336	-98.7697
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-98.7697 (269)
Total CO2, kg/year			190.2803 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.3900 (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	325.1297	1.5871	516.0239 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1314.5373	1.5213	1999.8163 (278)
Space and water heating			2515.8402 (279)
Pumps, fans and electric keep-hot	194.6136	1.5128	294.4115 (281)
Energy for lighting	174.3020	1.5338	267.3502 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-739.3813	1.4936	-1104.3757
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-1104.3757 (283)
Total Primary energy kWh/year			1973.2261 (286)
Dwelling Primary energy Rate (DPER)			24.7600 (287)

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

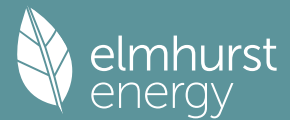
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	39.8400 (1b)	x 2.7400 (2b)	= 109.1616 (1b) - (3b)
First floor	39.8400 (1c)	x 2.4600 (2c)	= 98.0064 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	79.6800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n) =	207.1680 (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	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1448 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3948 (18)
Number of sides sheltered	0 (19)

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Shelter factor
Infiltration rate adjusted to include shelter factor

$$(20) = 1 - [0.075 \times (19)] = 1.0000 \quad (20)$$
$$(21) = (18) \times (20) = 0.3948 \quad (21)$$

	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													
Effective ac	0.5034	0.4935	0.4836	0.4343	0.4244	0.3751	0.3751	0.3652	0.3948	0.4244	0.4442	0.4639	(22b)
	0.6267	0.6218	0.6170	0.5943	0.5901	0.5703	0.5703	0.5667	0.5779	0.5901	0.5986	0.6076	(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			2.2000	1.0000	2.2000			(26)
TER Opening Type			10.6700	1.1450	12.2176			(27)
Heatloss Floor 1			39.8400	0.1300	5.1792			(28a)
External Wall GF	92.8900	12.8700	80.0200	0.1800	14.4036			(29a)
External Roof 1	39.8400		39.8400	0.1100	4.3824			(30)
Total net area of external elements Aum(A, m2)			172.5700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.3828			(33)
Main dwelling								
Party Wall 1			43.9400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K

493.6674 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E5 Ground floor (normal)	17.8800	0.1600	2.8608	
E6 Intermediate floor within a dwelling	17.8800	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)	8.4600	0.0600	0.5076	
E12 Gable (insulation at ceiling level)	9.4200	0.0600	0.5652	
E16 Corner (normal)	10.3900	0.0900	0.9351	
E18 Party wall between dwellings	10.3900	0.0600	0.6234	
E2 Other lintels (including other steel lintels)	8.9000	0.0500	0.4450	
E3 Sill	6.1000	0.0500	0.3050	
E4 Jamb	17.5000	0.0500	0.8750	
P1 Party wall - Ground floor	8.4600	0.0800	0.6768	
P4 Party wall - Roof (insulation at ceiling level)	8.4600	0.1200	1.0152	

Thermal bridges (Sum(L x Psi) calculated using Appendix K)

8.8091 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 47.1919 (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	42.8444	42.5081	42.1784	40.6299	40.3402	38.9914	38.9914	38.7417	39.5110	40.3402	40.9263	41.5390	(38)
Heat transfer coeff	90.0363	89.6999	89.3703	87.8217	87.5320	86.1833	86.1833	85.9335	86.7028	87.5320	88.1181	88.7309	(39)
Average = Sum(39)m / 12 =												87.8203	

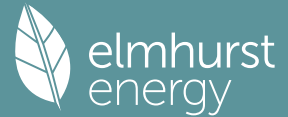
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1300	1.1258	1.1216	1.1022	1.0985	1.0816	1.0816	1.0785	1.0881	1.0985	1.1059	1.1136	(40)
HLP (average)												1.1022	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.4568 (42)
Hot water usage for mixer showers													
65.4115	64.4285	62.9961	60.2554	58.2328	55.9772	54.6952	56.1168	57.6751	60.0969	62.8965	65.1609	(42a)	
Hot water usage for baths													
28.2523	27.8327	27.2419	26.1524	25.3366	24.4321	23.9435	24.5302	25.1691	26.1370	27.2489	28.1568	(42b)	
Hot water usage for other uses													
39.7897	38.3428	36.8959	35.4490	34.0021	32.5552	32.5552	34.0021	35.4490	36.8959	38.3428	39.7897	(42c)	
Average daily hot water use (litres/day)													122.6740 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
133.4535	130.6040	127.1338	121.8568	117.5715	112.9645	111.1939	114.6491	118.2932	123.1298	128.4881	133.1074	(44)	
Energy content (annual)	211.3578	185.9784	195.4000	166.8158	158.2739	138.9031	134.4794	141.9595	145.8673	167.0859	183.0549	208.4140	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =			2037.5900
31.7037	27.8968	29.3100	25.0224	23.7411	20.8355	20.1719	21.2939	21.8801	25.0629	27.4582	31.2621	(46)	
Water storage loss (or HIU 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	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	(61)	
Total heat required for water heating calculated for each month													
257.9527	228.0641	241.9949	211.9077	204.8688	183.9949	181.0743	188.5544	190.9592	213.6808	228.1467	255.0089	(62)	
WWHRS	-29.9034	-26.4468	-27.6936	-22.9314	-21.3712	-18.2875	-17.1416	-18.2284	-18.9210	-22.3057	-25.2697	-29.3496	(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													
228.0493	201.6173	214.3013	188.9763	183.4976	165.7074	163.9326	170.3260	172.0382	191.3751	202.8770	225.6593	(64)	
12Total per year (kWh/year)													2308.3574 (64)
Electric shower(s)													2308 (64)
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													
107.5524	95.5064	102.2464	91.5397	89.9020	82.2587	81.9903	84.4775	84.5744	92.8320	96.9392	106.5736	(65)	

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

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Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	122.8381	122.8381	122.8381	122.8381	122.8381	122.8381	122.8381	122.8381	122.8381	122.8381	122.8381	122.8381 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	119.5385	132.3462	119.5385	123.5231	119.5385	123.5231	119.5385	119.5385	123.5231	119.5385	123.5231	119.5385 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	218.7704	221.0406	215.3199	203.1412	187.7677	173.3189	163.6661	161.3960	167.1167	179.2954	194.6688	209.1177 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	35.2838	35.2838	35.2838	35.2838	35.2838	35.2838	35.2838	35.2838	35.2838	35.2838	35.2838	35.2838 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-98.2705	-98.2705	-98.2705	-98.2705	-98.2705	-98.2705	-98.2705	-98.2705	-98.2705	-98.2705	-98.2705	-98.2705 (71)
Water heating gains (Table 5)												
	144.5597	142.1226	137.4280	127.1385	120.8360	114.2483	110.2020	113.5450	117.4644	124.7742	134.6378	143.2441 (72)
Total internal gains												
	545.7200	558.3609	535.1378	516.6543	490.9937	470.9417	453.2581	454.3309	467.9556	486.4595	515.6812	534.7517 (73)

6. Solar gains

[Jan]		Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
East		3.6600	19.6403	0.6300	0.7000	0.7700	21.9685 (76)
West		7.0100	19.6403	0.6300	0.7000	0.7700	42.0763 (80)
Solar gains							
	64.0448	125.2851	206.3268	300.9153	368.7830	377.5150	359.4097
Total gains							
	609.7648	683.6460	741.4646	817.5695	859.7766	848.4567	812.6678
							308.7276
							239.9666
							148.6614
							79.8563
							52.6673 (83)
							587.4190 (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	121.3567	121.8117	122.2611	124.4169	124.8287	126.7822	126.7822	127.1506	126.0225	124.8287	123.9984	123.1421
alpha	9.0904	9.1208	9.1507	9.2945	9.3219	9.4521	9.4521	9.4767	9.4015	9.3219	9.2666	9.2095
util living area												
	0.9998	0.9994	0.9974	0.9784	0.8766	0.6462	0.4664	0.5175	0.8125	0.9892	0.9994	0.9999 (86)
MIT												
	20.3193	20.4204	20.5760	20.7994	20.9539	20.9975	20.9999	20.9997	20.9824	20.7845	20.5193	20.3110 (87)
Th 2												
	19.9764	19.9799	19.9832	19.9991	20.0020	20.0159	20.0159	20.0184	20.0105	20.0020	19.9960	19.9898 (88)
util rest of house												
	0.9997	0.9990	0.9954	0.9624	0.8121	0.5493	0.3622	0.4075	0.7140	0.9781	0.9988	0.9998 (89)
MIT 2												
	19.1930	19.3253	19.5266	19.8149	19.9741	20.0151	20.0159	20.0184	20.0036	19.8042	19.4656	19.1933 (90)
Living area fraction												
									fLA = Living area / (4) =			0.1958 (91)
MIT												
	19.4135	19.5397	19.7321	20.0077	20.1659	20.2075	20.2085	20.2105	20.1953	19.9962	19.6719	19.4122 (92)
Temperature adjustment												
												0.0000
adjusted MIT												
	19.4135	19.5397	19.7321	20.0077	20.1659	20.2075	20.2085	20.2105	20.1953	19.9962	19.6719	19.4122 (93)

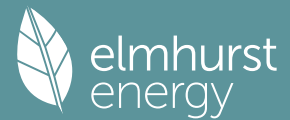
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9996	0.9988	0.9947	0.9626	0.8239	0.5684	0.3827	0.4291	0.7338	0.9780	0.9985	0.9997 (94)
Useful gains	609.5367	682.7940	737.5698	786.9642	708.3917	482.2494	310.9720	327.3907	519.4680	621.1534	594.6608	587.2629 (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												
	1360.7631	1313.1762	1182.5547	975.4935	741.0406	483.2698	310.9939	327.4524	528.4760	822.4653	1107.8112	1349.7885 (97)
Space heating kWh												
	558.9124	423.6169	331.0687	135.7411	24.2908	0.0000	0.0000	0.0000	0.0000	149.7761	369.4682	567.3190 (98a)
Space heating requirement - total per year (kWh/year)												2560.1933
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												
	558.9124	423.6169	331.0687	135.7411	24.2908	0.0000	0.0000	0.0000	0.0000	149.7761	369.4682	567.3190 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2560.1933
Space heating per m ²												(98c) / (4) = 32.1309 (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												
	558.9124	423.6169	331.0687	135.7411	24.2908	0.0000	0.0000	0.0000	0.0000	149.7761	369.4682	567.3190 (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)												
	605.5389	458.9565	358.6877	147.0651	26.3172	0.0000	0.0000	0.0000	0.0000	162.2710	400.2906	614.6468 (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												
	228.0493	201.6173	214.3013	188.9763	183.4976	165.7074	163.9326	170.3260	172.0382	191.3751	202.8770	225.6593 (64)
Efficiency of water heater												
	85.9896	85.6838	85.0316	83.3305	80.7568	79.8000	79.8000	79.8000	79.8000	83.5162	85.3865	79.8000 (216)
Fuel for water heating, kWh/month												
												86.0386 (217)

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	265.2055	235.3038	252.0254	226.7792	227.2224	207.6534	205.4294	213.4412	215.5867	229.1474	237.5986	262.2767	(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	24.8377	19.9258	17.9409	13.1443	10.1530	8.2951	9.2619	12.0390	15.6375	20.5172	23.1742	25.5281	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-37.1749	-52.3504	-75.1576	-84.3924	-90.9009	-84.8065	-83.7638	-79.1378	-70.9406	-59.8234	-40.8516	-32.1473	(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	-21.1587	-44.5024	-88.4410	-132.8165	-175.6026	-176.4376	-174.3551	-147.6227	-108.2034	-63.6279	-28.2451	-16.7316	(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												2773.7739	(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												2777.6695	(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)												200.4548	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1969.1918	(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												3868.7064	(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	2773.7739	0.2100	582.4925	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2777.6695	0.2100	583.3106	(264)
Space and water heating			1165.8031	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	200.4548	0.1443	28.9318	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-791.4472	0.1346	-106.5391	
PV Unit electricity exported	-1177.7446	0.1259	-148.2779	
Total			-254.8170	(269)
Total CO2, kg/year			951.8472	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.9500	(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	2773.7739	1.1300	3134.3645	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2777.6695	1.1300	3138.7666	(278)
Space and water heating			6273.1311	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	200.4548	1.5338	307.4643	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-791.4472	1.4975	-1185.1987	
PV Unit electricity exported	-1177.7446	0.4621	-544.2822	
Total			-1729.4810	(283)
Total Primary energy kWh/year			4981.2152	(286)
Target Primary Energy Rate (TPER)			62.5200	(287)

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Plot Reference	2B4P Mas			Issued on Date	08/04/2026
Assessment Reference	BeGreen	Plot Type Ref			
Plot Address	Itchen, Land West of Gatesmead, Haywards Heath, RH161SN			SAP Version	10.2
SAP Rating	88 B	DER	3.11	TER	11.88
Environmental	98 A	% DER < TER			73.82
CO ₂ Emissions (t/year)	0.19	DFEE	27.77	TFEE	36.34
Compliance Check	See BREL	% DFEE < TFEE			23.57
% DPER < TPER	47.38	DPER	32.66	TPER	62.07
Assessor Details	Mr. Mirza Baig			Assessor ID	CK52-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	70.3000 (1b)	2.4800 (2b)	174.3440 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	174.3440 (5)

2. Ventilation rate

	m ³ 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)

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	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	0	(19)

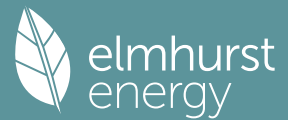
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1500 (21)

	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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (22b)
Balanced mechanical ventilation with heat recovery												
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)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												73.6000 (23c)
Effective ac	0.3232	0.3195	0.3157	0.2970	0.2932	0.2745	0.2745	0.2707	0.2820	0.2932	0.3007	0.3082 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			11.5600	1.0536	12.1801		(27)
Heatloss Floor 1			70.3100	0.1000	7.0310	110.0000	7734.1000 (28a)
External Wall GF	89.3700	11.5600	77.8100	0.1600	12.4496	190.0000	14783.9005 (29a)
Total net area of external elements Aum(A, m ²)			159.6800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.6607		(33)
Main dwelling							
Party Ceiling 1			70.3100			30.0000	2109.3000 (32b)
Internal Wall 1			127.9500			75.0000	9596.2498 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	34223.5503 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							486.8215 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E5 Ground floor (normal)				36.1100	0.0560	2.0222	
E6 Intermediate floor within a dwelling				36.1100	0.0050	0.1805	

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E16 Corner (normal)						14.8500	0.0360	0.5346				
E17 Corner (inverted - internal area greater than external area)						4.9500	-0.0450	-0.2228				
E2 Other lintels (including other steel lintels)						8.2000	0.0620	0.5084				
E3 Sill						7.2000	0.0390	0.2808				
E4 Jamb						17.2000	0.0520	0.8944				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											4.1982	(36)
Point Thermal bridges											0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	35.8588 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	18.5977	18.3820	18.1662	17.0875	16.8717	15.7930	15.7930	15.5772	16.2245	16.8717	17.3032	17.7347 (38)
Average = Sum(39)m / 12 =	54.4565	54.2408	54.0250	52.9463	52.7305	51.6518	51.6518	51.4360	52.0833	52.7305	53.1620	53.5935 (39)
												52.8924
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7746	0.7716	0.7685	0.7531	0.7501	0.7347	0.7347	0.7317	0.7409	0.7501	0.7562	0.7624 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.2534 (42)
Hot water usage for mixer showers												
	62.0015	61.0698	59.7120	57.1142	55.1970	53.0591	51.8439	53.1913	54.6684	56.9640	59.6176	61.7640 (42a)
Hot water usage for baths												
	26.7859	26.3881	25.8279	24.7950	24.0216	23.1640	22.7007	23.2570	23.8627	24.7804	25.8345	26.6954 (42b)
Hot water usage for other uses												
	37.7069	36.3358	34.9646	33.5934	32.2223	30.8511	30.8511	32.2223	33.5934	34.9646	36.3358	37.7069 (42c)
Average daily hot water use (litres/day)												116.2771 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	126.4944	123.7936	120.5045	115.5026	111.4409	107.0742	105.3957	108.6706	112.1246	116.7089	121.7879	126.1663 (44)
Energy conte	200.3362	176.2805	185.2110	158.1173	150.0209	131.6602	127.4670	134.5569	138.2608	158.3729	173.5092	197.5459 (45)
Energy content (annual)												Total = Sum(45)m = 1931.3386
Distribution loss (46)m = 0.15 x (45)m												
	30.0504	26.4421	27.7816	23.7176	22.5031	19.7490	19.1200	20.1835	20.7391	23.7559	26.0264	29.6319 (46)
Water storage loss (or HIU 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	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	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												
	245.6954	217.2501	230.5702	202.0133	195.3801	175.5562	172.8262	179.9161	182.1568	203.7321	217.4052	242.9051 (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												
	245.6954	217.2501	230.5702	202.0133	195.3801	175.5562	172.8262	179.9161	182.1568	203.7321	217.4052	242.9051 (64)
												Total per year (kWh/year) = Sum(64)m = 2465.4066 (64)
12Total per year (kWh/year)												2465
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												
	102.8991	91.3889	97.8700	87.6908	86.1693	78.8938	78.6701	81.0275	81.0885	88.9464	92.8086	101.9714 (65)

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

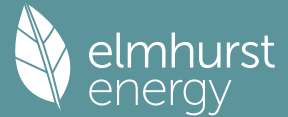
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	99.8664	110.5663	99.8664	103.1952	99.8664	103.1952	99.8664	99.8664	103.1952	99.8664	103.1952	99.8664 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	197.9962	200.0508	194.8733	183.8511	169.9375	156.8607	148.1246	146.0700	151.2475	162.2697	176.1833	189.2601 (68)
Pumps, fans	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
	-90.1354	-90.1354	-90.1354	-90.1354	-90.1354	-90.1354	-90.1354	-90.1354	-90.1354	-90.1354	-90.1354	-90.1354 (71)
Water heating gains (Table 5)												
	138.3053	135.9954	131.5457	121.7928	115.8190	109.5747	105.7394	108.9080	112.6229	119.5516	128.9008	137.0583 (72)
Total internal gains												
	492.9687	503.4134	483.0862	465.6399	442.4236	426.4315	410.5311	411.6451	423.8664	438.4884	465.0802	482.9856 (73)

6. Solar gains												

[Jan]												
			Area	Solar flux	g	FF		Access		Gains		
			m2	Table 6a	Specific data	Specific data		factor		W		
				W/m2	or Table 6b	or Table 6c		Table 6d				
North			1.5600	10.6334	0.4000	1.0000		0.7700		4.5982 (74)		
East			3.1200	19.6403	0.4000	1.0000		0.7700		16.9862 (76)		
South			6.8800	46.7521	0.4000	1.0000		0.7700		89.1625 (78)		

Solar gains	110.7469	188.0412	255.6649	314.0264	349.1940	345.5436	333.6097	307.5499	275.9075	207.3907	132.5403	94.8465 (83)
Total gains	603.7156	691.4546	738.7511	779.6663	791.6177	771.9751	744.1409	719.1950	699.7740	645.8791	597.6204	577.8321 (84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	174.5711	175.2655	175.9655	179.5507	180.2853	184.0506	184.0506	184.8226	182.5258	180.2853	178.8220	177.3822	21.0000 (85)
alpha	12.6381	12.6844	12.7310	12.9700	13.0190	13.2700	13.2700	13.3215	13.1684	13.0190	12.9215	12.8255	
util living area	0.9981	0.9888	0.9512	0.8094	0.6190	0.4282	0.3054	0.3290	0.5135	0.8321	0.9870	0.9988	(86)
Living	20.7665	20.8463	20.9205	20.9694	20.9758	20.9765	20.9765	20.9766	20.9763	20.9685	20.8742	20.7554	
Non living	20.0682	20.1482	20.2174	20.2666	20.2727	20.2867	20.2867	20.2895	20.2811	20.2692	20.1880	20.0672	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.8805	20.8463	20.9205	20.9694	20.9758	20.9765	20.9765	20.9766	20.9763	20.9685	20.8742	20.7896	(87)
Th 2	20.2754	20.2780	20.2807	20.2941	20.2968	20.3103	20.3103	20.3129	20.3049	20.2968	20.2914	20.2861	(88)
util rest of house	0.9970	0.9828	0.9307	0.7673	0.5725	0.3821	0.2575	0.2798	0.4618	0.7835	0.9790	0.9980	(89)
MIT 2	20.1694	20.1482	20.2174	20.2666	20.2727	20.2867	20.2867	20.2895	20.2811	20.2692	20.1880	20.0979	(90)
Living area fraction									FLA = Living area / (4) =			0.3518	(91)
MIT	20.4196	20.3938	20.4648	20.5138	20.5200	20.5294	20.5294	20.5312	20.5257	20.5152	20.4294	20.3412	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.4196	20.3938	20.4648	20.5138	20.5200	20.5294	20.5294	20.5312	20.5257	20.5152	20.4294	20.3412	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9972	0.9840	0.9365	0.7807	0.5873	0.3967	0.2727	0.2955	0.4782	0.7991	0.9809	0.9981	(94)
Useful gains	602.0430	680.3666	691.8508	608.7062	464.8966	306.2609	202.9582	212.4921	334.6597	516.1309	586.1954	576.7431	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	14.0000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	877.8158	840.3963	754.4468	614.9094	465.0854	306.2617	202.9582	212.4921	334.6703	522.8351	708.6182	865.0638	(97)
Space heating kWh	205.1750	107.5400	46.5714	4.4663	0.1405	0.0000	0.0000	0.0000	0.0000	4.9879	88.1444	214.5105	(98a)
Space heating requirement - total per year (kWh/year)												671.5360	
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	205.1750	107.5400	46.5714	4.4663	0.1405	0.0000	0.0000	0.0000	0.0000	4.9879	88.1444	214.5105	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												671.5360	
Space heating per m2										(98c) / (4) =		9.5524	(99)

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

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

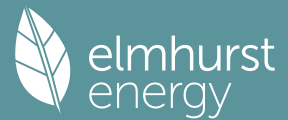
Fraction of space heat from main system(s)													0.0000 (201)
Efficiency of main space heating system 1 (in %)													1.0000 (202)
Efficiency of main space heating system 2 (in %)													227.2415 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (207)
													0.0000 (208)
Space heating requirement	205.1750	107.5400	46.5714	4.4663	0.1405	0.0000	0.0000	0.0000	0.0000	4.9879	88.1444	214.5105	(98)
Space heating efficiency (main heating system 1)	227.2415	227.2415	227.2415	227.2415	227.2415	0.0000	0.0000	0.0000	0.0000	227.2415	227.2415	227.2415	(210)
Space heating fuel (main heating system)	90.2894	47.3241	20.4942	1.9654	0.0618	0.0000	0.0000	0.0000	0.0000	2.1950	38.7889	94.3976	(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	245.6954	217.2501	230.5702	202.0133	195.3801	175.5562	172.8262	179.9161	182.1568	203.7321	217.4052	242.9051	(64)
Efficiency of water heater	189.7386	189.7386	189.7386	189.7386	189.7386	189.7386	189.7386	189.7386	189.7386	189.7386	189.7386	189.7386	(216)
Fuel for water heating, kWh/month	129.4915	114.4997	121.5199	106.4693	102.9733	92.5253	91.0865	94.8232	96.0041	107.3751	114.5814	128.0209	(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	13.1513	11.8785	13.1513	12.7270	13.1513	12.7270	13.1513	13.1513	12.7270	13.1513	12.7270	13.1513	(231)
Lighting	21.5029	17.2504	15.5321	11.3795	8.7898	7.1814	8.0184	10.4226	13.5379	17.7625	20.0627	22.1005	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-16.3991	-25.1061	-39.0427	-47.5035	-54.8900	-52.6260	-51.9419	-47.2920	-39.5050	-29.9019	-18.5960	-13.9471	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	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)	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)	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)	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)	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)	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)	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												295.5165	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												189.7386	
Water heating fuel used												1299.3700	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7280)
mechanical ventilation fans (SFP = 0.7280)

154.8454 (230a)

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Total electricity for the above, kWh/year	154.8454	(231)
Electricity for lighting (calculated in Appendix L)	173.5408	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-436.7512	(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	1486.5215	(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	295.5165	0.1599	47.2563 (261)
Total CO2 associated with community systems			0.0000 (273)
Water heating (other fuel)	1299.3700	0.1410	183.1557 (264)
Space and water heating			230.4120 (265)
Pumps, fans and electric keep-hot	154.8454	0.1387	21.4790 (267)
Energy for lighting	173.5408	0.1443	25.0473 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-436.7512	0.1329	-58.0470
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-58.0470 (269)
Total CO2, kg/year			218.8913 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.1100 (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	295.5165	1.5918	470.4130 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1299.3700	1.5212	1976.6172 (278)
Space and water heating			2447.0302 (279)
Pumps, fans and electric keep-hot	154.8454	1.5128	234.2501 (281)
Energy for lighting	173.5408	1.5338	266.1827 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-436.7512	1.4911	-651.2406
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-651.2406 (283)
Total Primary energy kWh/year			2296.2224 (286)
Dwelling Primary energy Rate (DPER)			32.6600 (287)

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

1. Overall dwelling characteristics

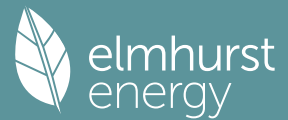
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	70.3000 (1b)	x 2.4800 (2b)	= 174.3440 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.3440 (5)

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	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 30.0000 / (5) = 0.1721 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4221 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.4221 (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												

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Effective ac	0.5381	0.5276	0.5170	0.4643	0.4537	0.4010	0.4010	0.3904	0.4221	0.4537	0.4748	0.4959 (22b)
	0.6448	0.6392	0.6337	0.6078	0.6029	0.5804	0.5804	0.5762	0.5891	0.6029	0.6127	0.6230 (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 Opening Type			11.5600	1.1450	13.2366		(27)
Heatloss Floor 1			70.3100	0.1300	9.1403		(28a)
External Wall GF	89.3700	11.5600	77.8100	0.1800	14.0058		(29a)
Total net area of external elements Aum(A, m2)			159.6800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		36.3827		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K

486.8215 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	36.1100	0.1600	5.7776
E6 Intermediate floor within a dwelling	36.1100	0.0000	0.0000
E16 Corner (normal)	14.8500	0.0900	1.3365
E17 Corner (inverted - internal area greater than external area)	4.9500	-0.0900	-0.4455
E2 Other lintels (including other steel lintels)	8.2000	0.0500	0.4100
E3 Sill	7.2000	0.0500	0.3600
E4 Jamb	17.2000	0.0500	0.8600

Thermal bridges (Sum(L x Psi) calculated using Appendix K)

8.2986 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 44.6813 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	37.0976	36.7741	36.4570	34.9676	34.6890	33.3918	33.3918	33.1516	33.8914	34.6890	35.2527	35.8420 (38)
Average = Sum(39)m / 12 =	81.7789	81.4554	81.1383	79.6490	79.3703	78.0731	78.0731	77.8329	78.5728	79.3703	79.9340	80.5234 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1633	1.1587	1.1542	1.1330	1.1290	1.1106	1.1106	1.1072	1.1177	1.1290	1.1370	1.1454 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

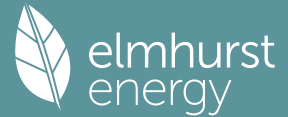
Assumed occupancy												2.2534 (42)
Hot water usage for mixer showers												
62.0015	61.0698	59.7120	57.1142	55.1970	53.0591	51.8439	53.1913	54.6684	56.9640	59.6176	61.7640 (42a)	
Hot water usage for baths												
26.7859	26.3881	25.8279	24.7950	24.0216	23.1640	22.7007	23.2570	23.8627	24.7804	25.8345	26.6954 (42b)	
Hot water usage for other uses												
37.7069	36.3358	34.9646	33.5934	32.2223	30.8511	30.8511	32.2223	33.5934	34.9646	36.3358	37.7069 (42c)	
Average daily hot water use (litres/day)												116.2771 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	126.4944	123.7936	120.5045	115.5026	111.4409	107.0742	105.3957	108.6706	112.1246	116.7089	121.7879	126.1663 (44)
Energy content (annual)	200.3362	176.2805	185.2110	158.1173	150.0209	131.6602	127.4670	134.5569	138.2608	158.3729	173.5092	197.5459 (45)
Distribution loss (46)m = 0.15 x (45)m	30.0504	26.4421	27.7816	23.7176	22.5031	19.7490	19.1200	20.1835	20.7391	23.7559	26.0264	29.6319 (46)
Water storage loss (or HIU 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	246.9311	218.3662	231.8059	203.2092	196.6158	176.7520	174.0619	181.1518	183.3526	204.9678	218.6010	244.1408 (62)
WWHRS	-28.3445	-25.0681	-26.2499	-21.7359	-20.2571	-17.3342	-16.2480	-17.2781	-17.9346	-21.1429	-23.9523	-27.8196 (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	218.5865	193.2981	205.5560	181.4732	176.3587	159.4179	157.8139	163.8737	165.4181	183.8249	194.6487	216.3212 (64)
12Total per year (kWh/year)												2216.5907 (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	103.8877	92.2818	98.8586	88.6475	87.1579	79.8505	79.6587	82.0161	82.0452	89.9349	93.7653	102.9599 (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	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	103.6371	114.7411	103.6371	107.0917	103.6371	107.0917	103.6371	103.6371	107.0917	103.6371	107.0917	103.6371 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.9962	200.0508	194.8733	183.8511	169.9375	156.8607	148.1246	146.0700	151.2475	162.2697	176.1833	189.2601 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669 (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)	-90.1354	-90.1354	-90.1354	-90.1354	-90.1354	-90.1354	-90.1354	-90.1354	-90.1354	-90.1354	-90.1354	-90.1354 (71)
Water heating gains (Table 5)	139.6340	137.3242	132.8744	123.1215	117.1477	110.9034	107.0681	110.2367	113.9517	120.8803	130.2296	138.3870 (72)
Total internal gains												

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501.0681 511.9168 491.1856 473.8650 450.5230 431.6566 415.6306 416.7446 429.0916 446.5878 473.3053 491.0850 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				1.5600	10.6334	0.6300	0.7000	0.7700	5.0695 (74)			
East				3.1200	19.6403	0.6300	0.7000	0.7700	18.7272 (76)			
South				6.8800	46.7521	0.6300	0.7000	0.7700	98.3017 (78)			
Solar gains	122.0985	207.3155	281.8706	346.2141	384.9864	380.9619	367.8047	339.0737	304.1880	228.6482	146.1256	104.5683 (83)
Total gains	623.1666	719.2323	773.0562	820.0791	835.5095	812.6184	783.4353	755.8183	733.2796	675.2361	619.4309	595.6533 (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	116.2468	116.7085	117.1646	119.3555	119.7745	121.7646	121.7646	122.1404	120.9903	119.7745	118.9298	118.0594
alpha	8.7498	8.7806	8.8110	8.9570	8.9850	9.1176	9.1176	9.1427	9.0660	8.9850	8.9287	8.8706
util living area	0.9994	0.9977	0.9914	0.9561	0.8358	0.6121	0.4383	0.4734	0.7263	0.9654	0.9976	0.9996 (86)
MIT	20.3532	20.4827	20.6426	20.8431	20.9652	20.9980	20.9999	20.9998	20.9916	20.8483	20.5694	20.3393 (87)
Th 2	19.9495	19.9532	19.9568	19.9740	19.9772	19.9922	19.9922	19.9950	19.9864	19.9772	19.9707	19.9639 (88)
util rest of house	0.9991	0.9962	0.9856	0.9291	0.7650	0.5174	0.3380	0.3702	0.6271	0.9378	0.9957	0.9994 (89)
MIT 2	19.2152	19.3835	19.5878	19.8394	19.9572	19.9916	19.9922	19.9950	19.9835	19.8527	19.5091	19.2094 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.6155	19.7701	19.9589	20.1924	20.3118	20.3457	20.3467	20.3485	20.3381	20.2029	19.8821	19.6069 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.6155	19.7701	19.9589	20.1924	20.3118	20.3457	20.3467	20.3485	20.3381	20.2029	19.8821	19.6069 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9989	0.9958	0.9856	0.9359	0.7898	0.5509	0.3733	0.4065	0.6626	0.9452	0.9955	0.9992 (94)
Useful gains	622.4691	716.2077	761.9188	767.4725	659.8660	447.6869	292.4928	307.2712	485.8549	638.2630	616.6147	595.1913 (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	1252.4852	1211.2531	1092.0302	899.4306	683.5231	448.5810	292.5158	307.3199	490.1447	762.1877	1021.7234	1240.6121 (97)
Space heating kWh	468.7319	332.6705	245.6029	95.0099	17.6009	0.0000	0.0000	0.0000	0.0000	92.2000	291.6783	480.1930 (98a)
Space heating requirement - total per year (kWh/year)	2023.6873											
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	468.7319	332.6705	245.6029	95.0099	17.6009	0.0000	0.0000	0.0000	0.0000	92.2000	291.6783	480.1930 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2023.6873											
Space heating per m ²	(98c) / (4) = 28.7864 (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	468.7319	332.6705	245.6029	95.0099	17.6009	0.0000	0.0000	0.0000	0.0000	92.2000	291.6783	480.1930 (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)	507.8352	360.4230	266.0920	102.9359	19.0692	0.0000	0.0000	0.0000	0.0000	99.8916	316.0111	520.2525 (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	218.5865	193.2981	205.5560	181.4732	176.3587	159.4179	157.8139	163.8737	165.4181	183.8249	194.6487	216.3212 (64)
Efficiency of water heater	85.7252	85.2659	84.4600	82.6796	80.5407	79.8000	79.8000	79.8000	79.8000	82.5962	84.9647	79.8000 (216)
Fuel for water heating, kWh/month	254.9851	226.7004	243.3768	219.4898	218.9682	199.7718	197.7617	205.3555	207.2908	222.5585	229.0936	252.1378 (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	21.5337	17.2752	15.5544	11.3958	8.8024	7.1917	8.0299	10.4375	13.5573	17.7880	20.0915	22.1322 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-33.0166	-46.6132	-67.1031	-75.5776	-81.6209	-76.2453	-75.3175	-71.0504	-63.5253	-53.3740	-36.3270	-28.5383 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	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)	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)	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)	-18.4499	-38.8381	-77.2365	-116.0613	-153.5096	-154.2449	-152.4154	-129.0157	-94.5296	-55.5445	-24.6356	-14.5866 (233b)

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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	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	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	0.0000	(235d)
Annual totals kWh/year														
Space heating fuel - main system 1													2192.5106	(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													2677.4900	(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)													173.7896	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-1737.3769	(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													3392.4133	(238)

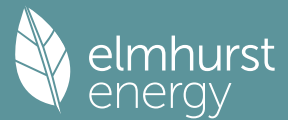
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2192.5106	0.2100	460.4272 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2677.4900	0.2100	562.2729 (264)
Space and water heating			1022.7001 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	173.7896	0.1443	25.0832 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-708.3091	0.1345	-95.3015
PV Unit electricity exported	-1029.0678	0.1259	-129.5429
Total			-224.8445 (269)
Total CO2, kg/year			834.8681 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.8800 (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	2192.5106	1.1300	2477.5369 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2677.4900	1.1300	3025.5637 (278)
Space and water heating			5503.1007 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	173.7896	1.5338	266.5643 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-708.3091	1.4973	-1060.5259
PV Unit electricity exported	-1029.0678	0.4621	-475.5113
Total			-1536.0372 (283)
Total Primary energy kWh/year			4363.7285 (286)
Target Primary Energy Rate (TPER)			62.0700 (287)

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Plot Reference	3B5P				Issued on Date	08/04/2026	
Assessment Reference	BeGreen			Plot Type Ref			
Plot Address	Beaconsfield, Land West of Gatesmead, Haywards Heath, RH161SN				SAP Version	10.2	
SAP Rating	90 B	DER	2.56	TER	12.27		
Environmental	98 A	% DER < TER				79.14	
CO ₂ Emissions (t/year)	0.19	DFEE	35.77	TFEE	41.32		
Compliance Check	See BREL	% DFEE < TFEE				13.44	
% DPER < TPER	58.70	DPER	26.51	TPER	64.19		
Assessor Details	Mr. Mirza Baig				Assessor ID	CK52-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	41.6100 (1b)	x 2.7400 (2b)	= 114.0114 (1b) - (3b)
First floor	41.6100 (1c)	x 2.4600 (2c)	= 102.3606 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 216.3720 (5)

2. Ventilation rate

	m ³ 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)
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	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (22b)
Balanced mechanical ventilation with heat recovery												
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)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.0000 (23c)
Effective ac	0.3312	0.3275	0.3237	0.3050	0.3013	0.2825	0.2825	0.2788	0.2900	0.3013	0.3087	0.3163 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Front Door			2.1000	1.0000	2.1000		(26)
Window			13.2400	1.0536	13.9502		(27)
Heatloss Floor 1			41.6100	0.1000	4.1610	110.0000	4577.1000 (28a)
External Wall GF	95.4400	15.3400	80.1000	0.1600	12.8160	190.0000	15219.0005 (29a)
External Roof 1	41.6100		41.6100	0.1000	4.1610	9.0000	374.4900 (30)
Total net area of external elements Aum(A, m ²)			178.6600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.1882		(33)
Main dwelling							
Party Wall 1			41.6100	0.0000	0.0000	140.0000	5825.4001 (32)
Internal Wall 1			214.5900			75.0000	16094.2497 (32c)
Internal Ceiling 1			41.6100			9.0000	374.4900 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	42464.7303 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							510.2707 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	18.3700	0.0560	1.0287
E6 Intermediate floor within a dwelling	18.3700	0.0050	0.0919
E10 Eaves (insulation at ceiling level)	8.4600	0.0500	0.4230
E12 Gable (insulation at ceiling level)	10.1600	0.0570	0.5791
E16 Corner (normal)	10.3900	0.0360	0.3740
E18 Party wall between dwellings	10.3900	0.0390	0.4052
E2 Other lintels (including other steel lintels)	11.4500	0.0620	0.7099
E3 Sill	8.6500	0.0390	0.3374
E4 Jamb	25.1000	0.0520	1.3052
P1 Party wall - Ground floor	8.4600	0.3200	2.7072
P4 Party wall - Roof (insulation at ceiling level)	8.4600	0.0420	0.3553
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.3169 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	45.5051 (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	23.6522	23.3844	23.1166	21.7778	21.5101	20.1713	20.1713	19.9035	20.7068	21.5101	22.0456	22.5811	(38)
Heat transfer coeff	69.1573	68.8895	68.6217	67.2829	67.0152	65.6764	65.6764	65.4086	66.2119	67.0152	67.5507	68.0862	(39)
Average = Sum(39)m / 12 =												67.2160	
HLP	0.8310	0.8278	0.8246	0.8085	0.8053	0.7892	0.7892	0.7860	0.7956	0.8053	0.8117	0.8181	(40)
HLP (average)												0.8077	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5211 (42)
Hot water usage for mixer showers	66.4907	65.4915	64.0354	61.2495	59.1935	56.9008	55.5976	57.0426	58.6266	61.0884	63.9341	66.2359	(42a)
Hot water usage for baths	28.7164	28.2899	27.6893	26.5820	25.7528	24.8334	24.3368	24.9332	25.5825	26.5663	27.6965	28.6193	(42b)
Hot water usage for other uses	40.4488	38.9780	37.5071	36.0362	34.5654	33.0945	33.0945	34.5654	36.0362	37.5071	38.9780	40.4488	(42c)
Average daily hot water use (litres/day)												124.6985	(43)
Daily hot water use	135.6559	132.7594	129.2318	123.8677	119.5117	114.8287	113.0289	116.5411	120.2454	125.1618	130.6086	135.3041	(44)
Energy conte	214.8458	189.0475	198.6245	169.5687	160.8858	141.1953	136.6986	144.3023	148.2746	169.8434	186.0759	211.8535	(45)
Energy content (annual)										Total = Sum(45)m =		2071.2158	
Distribution loss (46)m = 0.15 x (45)m	32.2269	28.3571	29.7937	25.4353	24.1329	21.1793	20.5048	21.6453	22.2412	25.4765	27.9114	31.7780	(46)
Water storage loss (or HIU loss):													
Store volume												180.0000	(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	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	260.2050	230.0171	243.9837	213.4647	206.2450	185.0913	182.0578	189.6615	192.1706	215.2026	229.9719	257.2127	(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	260.2050	230.0171	243.9837	213.4647	206.2450	185.0913	182.0578	189.6615	192.1706	215.2026	229.9719	257.2127	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2605.2838	(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	107.7236	95.6340	102.3300	91.4984	89.7819	82.0642	81.7396	84.2679	84.4181	92.7603	96.9870	106.7287	(65)

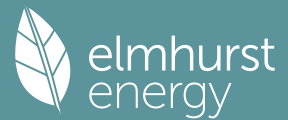
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	126.0562	126.0562	126.0562	126.0562	126.0562	126.0562	126.0562	126.0562	126.0562	126.0562	126.0562	126.0562	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	113.9871	126.2000	113.9871	117.7867	113.9871	117.7867	113.9871	113.9871	117.7867	113.9871	117.7867	113.9871	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	226.0385	228.3840	222.4733	209.8900	194.0058	179.0769	169.1035	166.7579	172.6687	185.2520	201.1362	216.0651	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6056	35.6056	35.6056	35.6056	35.6056	35.6056	35.6056	35.6056	35.6056	35.6056	35.6056	35.6056	(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)	-100.8450	-100.8450	-100.8450	-100.8450	-100.8450	-100.8450	-100.8450	-100.8450	-100.8450	-100.8450	-100.8450	-100.8450	(71)
Water heating gains (Table 5)	144.7898	142.3125	137.5403	127.0811	120.6746	113.9781	109.8651	113.2633	117.2474	124.6778	134.7042	143.4525	(72)
Total internal gains	545.6322	557.7134	534.8176	515.5746	489.4843	471.6585	453.7726	454.8251	468.5196	484.7338	514.4439	534.3215	(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	6.0000	10.6334	0.4000	1.0000	0.7700	17.6855 (74)
East	7.2400	19.6403	0.4000	1.0000	0.7700	39.4166 (76)

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Solar gains	57.1021	110.9050	184.4154	277.4480	351.2361	365.3748	345.4022	288.5461	216.7387	131.7261	70.9651	47.1578 (83)
Total gains	602.7343	668.6185	719.2330	793.0226	840.7204	837.0333	799.1748	743.3713	685.2583	616.4599	585.4091	581.4793 (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	170.5643	171.2272	171.8953	175.3157	176.0162	179.6043	179.6043	180.3395	178.1516	176.0162	174.6208	173.2474
alpha	12.3710	12.4151	12.4597	12.6877	12.7344	12.9736	12.9736	13.0226	12.8768	12.7344	12.6414	12.5498
util living area												
	0.9998	0.9993	0.9951	0.9385	0.7370	0.5021	0.3616	0.4047	0.6655	0.9703	0.9990	0.9999 (86)
Living	20.6725	20.7334	20.8219	20.9370	20.9735	20.9759	20.9759	20.9760	20.9753	20.9212	20.7811	20.6668
Non living	19.9282	19.9916	20.0815	20.1976	20.2235	20.2386	20.2386	20.2415	20.2328	20.1898	20.0521	19.9329
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.8324	20.7334	20.8219	20.9370	20.9735	20.9759	20.9759	20.9760	20.9753	20.9212	20.7811	20.7134 (87)
Th 2	20.2265	20.2293	20.2321	20.2460	20.2488	20.2627	20.2627	20.2655	20.2571	20.2488	20.2432	20.2376 (88)
util rest of house												
	0.9997	0.9987	0.9916	0.9080	0.6798	0.4443	0.3010	0.3401	0.5946	0.9472	0.9982	0.9998 (89)
MIT 2	20.0739	19.9916	20.0815	20.1976	20.2235	20.2386	20.2386	20.2415	20.2328	20.1898	20.0521	19.9755 (90)
Living area fraction												0.1744 (91)
MIT	20.2062	20.1209	20.2106	20.3265	20.3542	20.3672	20.3672	20.3696	20.3622	20.3174	20.1792	20.1042 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2062	20.1209	20.2106	20.3265	20.3542	20.3672	20.3672	20.3696	20.3622	20.3174	20.1792	20.1042 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9997	0.9986	0.9915	0.9117	0.6879	0.4525	0.3096	0.3493	0.6047	0.9498	0.9981	0.9998 (94)
Useful gains	602.5746	667.7081	713.1041	723.0150	578.3657	378.7609	247.4155	259.6452	414.3800	585.5367	584.3188	581.3693 (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	1100.0281	1048.5605	940.8465	768.8106	579.9661	378.7680	247.4156	259.6454	414.6341	651.2109	883.5068	1082.8565 (97)
Space heating kWh	370.1054	255.9328	169.4404	32.9728	1.1907	0.0000	0.0000	0.0000	0.0000	48.8616	215.4154	373.1065 (98a)
Space heating requirement - total per year (kWh/year)												1467.0256
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	370.1054	255.9328	169.4404	32.9728	1.1907	0.0000	0.0000	0.0000	0.0000	48.8616	215.4154	373.1065 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1467.0256
Space heating per m2										(98c) / (4) =		17.6283 (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 %)												364.0016 (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	370.1054	255.9328	169.4404	32.9728	1.1907	0.0000	0.0000	0.0000	0.0000	48.8616	215.4154	373.1065 (98)
Space heating efficiency (main heating system 1)	364.0016	364.0016	364.0016	364.0016	364.0016	0.0000	0.0000	0.0000	0.0000	364.0016	364.0016	364.0016 (210)
Space heating fuel (main heating system)	101.6769	70.3109	46.5493	9.0584	0.3271	0.0000	0.0000	0.0000	0.0000	13.4235	59.1798	102.5013 (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	260.2050	230.0171	243.9837	213.4647	206.2450	185.0913	182.0578	189.6615	192.1706	215.2026	229.9719	257.2127 (64)
Efficiency of water heater (217)m	192.2855	192.2855	192.2855	192.2855	192.2855	192.2855	192.2855	192.2855	192.2855	192.2855	192.2855	192.2855 (216)
Fuel for water heating, kWh/month	135.3222	119.6227	126.8862	111.0145	107.2598	96.2586	94.6810	98.6354	99.9403	111.9183	119.5992	133.7661 (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	19.7742	17.8605	19.7742	19.1363	19.7742	19.1363	19.7742	19.7742	19.1363	19.7742	19.1363	19.7742 (231)
Lighting	22.0384	17.6800	15.9189	11.6628	9.0087	7.3602	8.2181	10.6821	13.8750	18.2048	20.5623	22.6509 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-30.5881	-45.7720	-69.3677	-81.0382	-91.0145	-86.4983	-85.3776	-78.8112	-67.3009	-53.1594	-34.3396	-26.1370 (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												403.0273 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)

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Efficiency of water heater	192.2855	
Water heating fuel used	1354.9042	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8820)		
mechanical ventilation fans (SFP = 0.8820)	232.8249	(230a)
Total electricity for the above, kWh/year	232.8249	(231)
Electricity for lighting (calculated in Appendix L)	177.8621	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-749.4046	(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	1419.2139	(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	403.0273	0.1582	63.7531 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1354.9042	0.1410	191.0288 (264)
Space and water heating			254.7820 (265)
Pumps, fans and electric keep-hot	232.8249	0.1387	32.2957 (267)
Energy for lighting	177.8621	0.1443	25.6710 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-749.4046	0.1336	-100.0946
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-100.0946 (269)
Total CO2, kg/year			212.6541 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.5600 (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	403.0273	1.5856	639.0300 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1354.9042	1.5213	2061.2657 (278)
Space and water heating			2700.2956 (279)
Pumps, fans and electric keep-hot	232.8249	1.5128	352.2176 (281)
Energy for lighting	177.8621	1.5338	272.8109 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-749.4046	1.4936	-1119.2949
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-1119.2949 (283)
Total Primary energy kWh/year			2206.0291 (286)
Dwelling Primary energy Rate (DPER)			26.5100 (287)

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

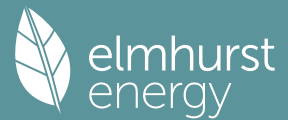
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	41.6100 (1b)	x 2.7400 (2b)	= 114.0114 (1b) - (3b)
First floor	41.6100 (1c)	x 2.4600 (2c)	= 102.3606 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	83.2200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n)	= 216.3720 (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	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1387 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3887 (18)
Number of sides sheltered	0 (19)

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Shelter factor
Infiltration rate adjusted to include shelter factor

$$(20) = 1 - [0.075 \times (19)] = 1.0000 \quad (20)$$
$$(21) = (18) \times (20) = 0.3887 \quad (21)$$

	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													
Effective ac	0.4955	0.4858	0.4761	0.4275	0.4178	0.3692	0.3692	0.3595	0.3887	0.4178	0.4372	0.4567	(22b)
	0.6228	0.6180	0.6133	0.5914	0.5873	0.5682	0.5682	0.5646	0.5755	0.5873	0.5956	0.6043	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type			13.2400	1.1450	15.1603			(27)
Heatloss Floor 1			41.6100	0.1300	5.4093			(28a)
External Wall GF	95.4400	15.3400	80.1000	0.1800	14.4180			(29a)
External Roof 1	41.6100		41.6100	0.1100	4.5771			(30)
Total net area of external elements Aum(A, m2)			178.6600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.6647			(33)
Main dwelling								
Party Wall 1			41.6100	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K

510.2707 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E5 Ground floor (normal)	18.3700	0.1600	2.9392	
E6 Intermediate floor within a dwelling	18.3700	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)	8.4600	0.0600	0.5076	
E12 Gable (insulation at ceiling level)	10.1600	0.0600	0.6096	
E16 Corner (normal)	10.3900	0.0900	0.9351	
E18 Party wall between dwellings	10.3900	0.0600	0.6234	
E2 Other lintels (including other steel lintels)	11.4500	0.0500	0.5725	
E3 Sill	8.6500	0.0500	0.4325	
E4 Jamb	25.1000	0.0500	1.2550	
P1 Party wall - Ground floor	8.4600	0.0800	0.6768	
P4 Party wall - Roof (insulation at ceiling level)	8.4600	0.1200	1.0152	

Thermal bridges (Sum(L x Psi) calculated using Appendix K)

9.5669 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 51.2316 (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	44.4678	44.1274	43.7937	42.2265	41.9333	40.5683	40.5683	40.3155	41.0940	41.9333	42.5265	43.1466	(38)
Heat transfer coeff	95.6994	95.3590	95.0253	93.4581	93.1649	91.7999	91.7999	91.5471	92.3256	93.1649	93.7581	94.3782	(39)
Average = Sum(39)m / 12 =													93.4567

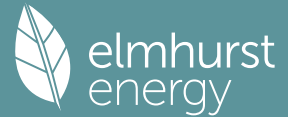
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1500	1.1459	1.1419	1.1230	1.1195	1.1031	1.1031	1.1001	1.1094	1.1195	1.1266	1.1341	(40)
HLP (average)												1.1230	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5211 (42)
Hot water usage for mixer showers													
66.4907	65.4915	64.0354	61.2495	59.1935	56.9008	55.5976	57.0426	58.6266	61.0884	63.9341	66.2359	66.2359	(42a)
Hot water usage for baths													
28.7164	28.2899	27.6893	26.5820	25.7528	24.8334	24.3368	24.9332	25.5825	26.5663	27.6965	28.6193	28.6193	(42b)
Hot water usage for other uses													
40.4488	38.9780	37.5071	36.0362	34.5654	33.0945	33.0945	34.5654	36.0362	37.5071	38.9780	40.4488	40.4488	(42c)
Average daily hot water use (litres/day)													124.6985 (43)
Daily hot water use													
135.6559	132.7594	129.2318	123.8677	119.5117	114.8287	113.0289	116.5411	120.2454	125.1618	130.6086	135.3041	135.3041	(44)
Energy conte	214.8458	189.0475	198.6245	169.5687	160.8858	141.1953	136.6986	144.3023	148.2746	169.8434	186.0759	211.8535	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
32.2269	28.3571	29.7937	25.4353	24.1329	21.1793	20.5048	21.6453	22.2412	25.4765	27.9114	31.7780	31.7780	(46)
Water storage loss (or HIU loss):													
Store volume													180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.5520 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8381 (55)
Total storage loss													
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	(56)
If cylinder contains dedicated solar storage													
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	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													
264.0885	233.5248	247.8672	217.2229	210.1284	188.8495	185.9413	193.5449	195.9288	219.0860	233.7301	261.0962	261.0962	(62)
WWHRS	-30.3968	-26.8832	-28.1505	-23.3097	-21.7238	-18.5892	-17.4244	-18.5291	-19.2331	-22.6737	-25.6866	-29.8339	(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													
233.6917	206.6416	219.7167	193.9132	188.4046	170.2602	168.5168	175.0158	176.6957	196.4123	208.0435	231.2623	231.2623	(64)
Total per year (kWh/year)													2368.5745 (64)
Electric shower(s)													2369 (64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month													
110.8304	98.4401	105.4368	94.5050	92.8887	85.0708	84.8464	87.3746	87.4247	95.8671	99.9936	109.8354	109.8354	(65)

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

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Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	126.0562	126.0562	126.0562	126.0562	126.0562	126.0562	126.0562	126.0562	126.0562	126.0562	126.0562	126.0562 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	119.0782	131.8366	119.0782	123.0475	119.0782	123.0475	119.0782	119.0782	123.0475	119.0782	123.0475	119.0782 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	226.0385	228.3840	222.4733	209.8900	194.0058	179.0769	169.1035	166.7579	172.6687	185.2520	201.1362	216.0651 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	35.6056	35.6056	35.6056	35.6056	35.6056	35.6056	35.6056	35.6056	35.6056	35.6056	35.6056	35.6056 (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)												
	-100.8450	-100.8450	-100.8450	-100.8450	-100.8450	-100.8450	-100.8450	-100.8450	-100.8450	-100.8450	-100.8450	-100.8450 (71)
Water heating gains (Table 5)												
	148.9656	146.4883	141.7161	131.2569	124.8503	118.1539	114.0409	117.4390	121.4231	128.8536	138.8800	147.6283 (72)
Total internal gains												
	557.8991	570.5258	547.0845	528.0112	501.7512	481.0951	463.0394	464.0920	477.9562	497.0006	526.8805	546.5884 (73)

6. Solar gains

[Jan]		Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North		6.0000	10.6334	0.6300	0.7000	0.7700	19.4982 (74)
East		7.2400	19.6403	0.6300	0.7000	0.7700	43.4568 (76)
Solar gains							
	62.9550	122.2728	203.3179	305.8864	387.2378	402.8257	380.8059
Total gains	620.8541	692.7986	750.4024	833.8976	888.9890	883.9208	843.8454
							318.1221
							238.9544
							145.2280
							78.2391
							51.9914 (83)
							598.5798 (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	123.2584	123.6984	124.1328	126.2144	126.6117	128.4943	128.4943	128.8491	127.7625	126.6117	125.8106	124.9839
alpha	9.2172	9.2466	9.2755	9.4143	9.4408	9.5663	9.5663	9.5899	9.5175	9.4408	9.3874	9.3323
util living area												
	0.9999	0.9997	0.9984	0.9844	0.8922	0.6601	0.4784	0.5377	0.8434	0.9930	0.9996	0.9999 (86)
MIT												
	20.3094	20.4043	20.5554	20.7804	20.9481	20.9972	20.9999	20.9996	20.9770	20.7653	20.5054	20.3015 (87)
Th 2												
	19.9602	19.9636	19.9668	19.9821	19.9849	19.9983	19.9983	20.0008	19.9932	19.9849	19.9791	19.9731 (88)
util rest of house												
	0.9998	0.9994	0.9971	0.9717	0.8292	0.5597	0.3697	0.4214	0.7449	0.9850	0.9992	0.9999 (89)
MIT 2												
	19.1642	19.2886	19.4845	19.7772	19.9533	19.9975	19.9983	20.0007	19.9840	19.7651	19.4313	19.1647 (90)
Living area fraction												
									fLA = Living area / (4) =			0.1744 (91)
MIT												
	19.3639	19.4832	19.6712	19.9521	20.1268	20.1718	20.1729	20.1749	20.1571	19.9395	19.6185	19.3629 (92)
Temperature adjustment												
												0.0000
adjusted MIT												
	19.3639	19.4832	19.6712	19.9521	20.1268	20.1718	20.1729	20.1749	20.1571	19.9395	19.6185	19.3629 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9998	0.9992	0.9965	0.9712	0.8392	0.5774	0.3887	0.4417	0.7626	0.9845	0.9990	0.9998 (94)
Useful gains	620.7041	692.2447	747.7761	809.8902	746.0333	510.3379	327.9700	345.5050	546.7469	632.2434	604.5354	598.4777 (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												
	1441.6068	1390.6359	1251.6008	1032.9064	785.0797	511.4916	327.9938	345.5815	559.2290	870.1092	1173.7144	1431.0518 (97)
Space heating kWh												
	610.7516	469.3189	374.8456	160.5717	29.0505	0.0000	0.0000	0.0000	0.0000	176.9722	409.8089	619.4352 (98a)
Space heating requirement - total per year (kWh/year)												2850.7546
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												
	610.7516	469.3189	374.8456	160.5717	29.0505	0.0000	0.0000	0.0000	0.0000	176.9722	409.8089	619.4352 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2850.7546
Space heating per m ²												(98c) / (4) =
												34.2556 (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												
	610.7516	469.3189	374.8456	160.5717	29.0505	0.0000	0.0000	0.0000	0.0000	176.9722	409.8089	619.4352 (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)												
	661.7027	508.4711	406.1166	173.9672	31.4740	0.0000	0.0000	0.0000	0.0000	191.7359	443.9967	671.1107 (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												
	233.6917	206.6416	219.7167	193.9132	188.4046	170.2602	168.5168	175.0158	176.6957	196.4123	208.0435	231.2623 (64)
Efficiency of water heater												
												79.8000 (216)
(217)m												
	86.1123	85.8404	85.2471	83.6398	80.8953	79.8000	79.8000	79.8000	79.8000	83.8268	85.5511	86.1584 (217)
Fuel for water heating, kWh/month												

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	271.3801	240.7276	257.7410	231.8431	232.8993	213.3587	211.1740	219.3181	221.4231	234.3073	243.1803	268.4153	(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	24.7421	19.8490	17.8719	13.0937	10.1139	8.2632	9.2263	11.9927	15.5773	20.4382	23.0849	25.4298	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-38.6825	-54.4054	-78.0161	-87.4983	-94.1587	-87.8087	-86.7131	-81.9508	-73.5227	-62.0996	-42.4771	-33.4577	(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	-22.2427	-46.7504	-92.8509	-139.3607	-184.1849	-185.0419	-182.8734	-154.8842	-113.5802	-66.8363	-29.6895	-17.5928	(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												3088.5748	(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												2845.7679	(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)												199.6830	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2056.6785	(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												4163.3471	(238)

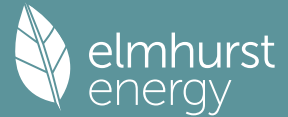
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3088.5748	0.2100	648.6007 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2845.7679	0.2100	597.6113 (264)
Space and water heating			1246.2120 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	199.6830	0.1443	28.8204 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-820.7906	0.1346	-110.5114
PV Unit electricity exported	-1235.8879	0.1259	-155.6167
Total			-266.1281 (269)
Total CO2, kg/year			1020.8336 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.2700 (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	3088.5748	1.1300	3490.0895 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2845.7679	1.1300	3215.7177 (278)
Space and water heating			6705.8072 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	199.6830	1.5338	306.2804 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-820.7906	1.4976	-1229.2246
PV Unit electricity exported	-1235.8879	0.4622	-571.2211
Total			-1800.4457 (283)
Total Primary energy kWh/year			5341.7427 (286)
Target Primary Energy Rate (TPER)			64.1900 (287)

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Plot Reference	3B6P				Issued on Date	08/04/2026	
Assessment Reference	BeGreen			Plot Type Ref			
Plot Address	Harrogate, Land West of Gatesmead, Haywards Heath, RH161SN				SAP Version	10.2	
SAP Rating	90 B	DER	2.26	TER	10.60		
Environmental	98 A	% DER < TER				78.68	
CO ₂ Emissions (t/year)	0.25	DFEE	34.92	TFEE	42.48		
Compliance Check	See BREL	% DFEE < TFEE				17.79	
% DPER < TPER	57.73	DPER	23.45	TPER	55.47		
Assessor Details	Mr. Mirza Baig				Assessor ID	CK52-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	64.0200 (1b)	x 2.7400 (2b)	= 175.4148 (1b) - (3b)
First floor	62.3100 (1c)	x 2.4600 (2c)	= 153.2826 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	126.3300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 328.6974 (5)

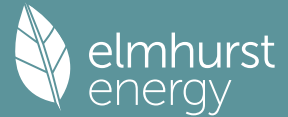
2. Ventilation rate

	m ³ 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)											
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	3.0000 (17)											
Infiltration rate	0.1500 (18)											
Number of sides sheltered	0 (19)											
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)											
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (21)											
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (22b)
Balanced mechanical ventilation with heat recovery												
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)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.0000 (23c)
Effective ac	0.3312	0.3275	0.3237	0.3050	0.3013	0.2825	0.2825	0.2788	0.2900	0.3013	0.3087	0.3163 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Front Door			2.1000	1.0000	2.1000		(26)
Window			22.4700	1.0536	23.6753		(27)
Heatloss Floor 1			64.0200	0.1000	6.4020	110.0000	7042.2000 (28a)
External Wall GF	176.7200	24.5700	152.1500	0.1600	24.3440	190.0000	28908.5002 (29a)
External Roof 1	62.3100		62.3100	0.1000	6.2310	9.0000	560.7900 (30)
Flat Roof	1.7000		1.7000	0.1000	0.1700	9.0000	15.3000 (30)
Total net area of external elements Aum(A, m ²)			304.7500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		62.9223		(33)
Main dwelling							
Internal Wall 1			252.8300			75.0000	18962.2501 (32c)
Internal Ceiling 1			62.3100			9.0000	560.7900 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	56049.8304 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							443.6779 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	34.7700	0.0560	1.9471
E6 Intermediate floor within a dwelling	33.1800	0.0050	0.1659
E10 Eaves (insulation at ceiling level)	17.8100	0.0500	0.8905
E12 Gable (insulation at ceiling level)	15.4100	0.0570	0.8784
E16 Corner (normal)	36.6400	0.0360	1.3190
E17 Corner (inverted - internal area greater than external area)	15.8600	-0.0900	-1.4274
E2 Other lintels (including other steel lintels)	17.6500	0.0620	1.0943
E3 Sill	13.9500	0.0390	0.5440
E4 Jamb	25.1000	0.0520	1.3052
E24 Eaves (insulation at ceiling level - inverted)	5.9200	0.0750	0.4440
E14 Flat roof	3.0900	0.0700	0.2163
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			7.3774 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	70.2997 (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	35.9307	35.5240	35.1172	33.0834	32.6766	30.6428	30.6428	30.2361	31.4563	32.6766	33.4902	34.3037	(38)
Heat transfer coeff	106.2304	105.8236	105.4169	103.3831	102.9763	100.9425	100.9425	100.5357	101.7560	102.9763	103.7898	104.6033	(39)
Average = Sum(39)m / 12 =												103.2814	
HLP	0.8409	0.8377	0.8345	0.8184	0.8151	0.7990	0.7990	0.7958	0.8055	0.8151	0.8216	0.8280	(40)
HLP (average)												0.8176	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8848 (42)
Hot water usage for mixer showers	72.5884	71.4976	69.9080	66.8665	64.6221	62.1190	60.6963	62.2739	64.0032	66.6907	69.7974	72.3103	(42a)
Hot water usage for baths	31.3386	30.8732	30.2178	29.0093	28.1044	27.1011	26.5591	27.2099	27.9186	28.9922	30.2255	31.2327	(42b)
Hot water usage for other uses	44.1732	42.5669	40.9606	39.3543	37.7480	36.1417	36.1417	37.7480	39.3543	40.9606	42.5669	44.1732	(42c)
Average daily hot water use (litres/day)												136.1374	(43)
Daily hot water use	148.1003	144.9377	141.0864	135.2302	130.4745	125.3618	123.3971	127.2318	131.2761	136.6435	142.5899	147.7162	(44)
Energy conte	234.5546	206.3893	216.8445	185.1234	175.6438	154.1470	149.2381	157.5396	161.8765	185.4239	203.1454	231.2879	(45)
Energy content (annual)										Total = Sum(45)m =		2261.2140	
Distribution loss (46)m = 0.15 x (45)m	35.1832	30.9584	32.5267	27.7685	26.3466	23.1220	22.3857	23.6309	24.2815	27.8136	30.4718	34.6932	(46)
Water storage loss (or HIU loss):													
Store volume												180.0000	(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	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	279.9138	247.3589	262.2037	229.0194	221.0030	198.0430	194.5973	202.8988	205.7725	230.7831	247.0414	276.6471	(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	279.9138	247.3589	262.2037	229.0194	221.0030	198.0430	194.5973	202.8988	205.7725	230.7831	247.0414	276.6471	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2795.2820	(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	114.2768	101.4001	108.3882	96.6703	94.6889	86.3707	85.9090	88.6693	88.9407	97.9408	102.6627	113.1906	(65)

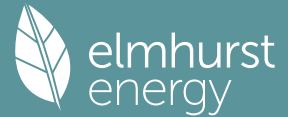
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	144.2399	144.2399	144.2399	144.2399	144.2399	144.2399	144.2399	144.2399	144.2399	144.2399	144.2399	144.2399	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	147.9062	163.7533	147.9062	152.8364	147.9062	152.8364	147.9062	147.9062	152.8364	147.9062	152.8364	147.9062	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	293.2406	296.2835	288.6154	272.2911	251.6844	232.3171	219.3786	216.3357	224.0037	240.3281	260.9347	280.3020	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4240	37.4240	37.4240	37.4240	37.4240	37.4240	37.4240	37.4240	37.4240	37.4240	37.4240	37.4240	(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)	-115.3919	-115.3919	-115.3919	-115.3919	-115.3919	-115.3919	-115.3919	-115.3919	-115.3919	-115.3919	-115.3919	-115.3919	(71)
Water heating gains (Table 5)	153.5978	150.8930	145.6830	134.2643	127.2700	119.9593	115.4691	119.1791	123.5288	131.6409	142.5870	152.1379	(72)
Total internal gains	661.0166	677.2018	648.4766	625.6638	593.1327	571.3848	549.0259	549.6930	566.6409	586.1472	622.6301	646.6181	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	2.8000	10.6334	0.4000	1.0000	0.7700	8.2532 (74)
South	11.1600	46.7521	0.4000	1.0000	0.7700	144.6299 (78)

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West				8.5100				19.6403				0.4000				1.0000				0.7700				46.3308 (80)			
Solar gains		199.2140	343.2718	477.7866	601.7513	680.1335	677.1662	652.1032	593.8190	521.0070	381.8013	239.3863	169.9541	(83)													
Total gains		860.2306	1020.4737	1126.2632	1227.4151	1273.2662	1248.5510	1201.1291	1143.5120	1087.6479	967.9485	862.0165	816.5722	(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	146.5625	147.1259	147.6936	150.5991	151.1940	154.2403	154.2403	154.8643	153.0072	151.1940	150.0089	148.8422
alpha	10.7708	10.8084	10.8462	11.0399	11.0796	11.2827	11.2827	11.3243	11.2005	11.0796	11.0006	10.9228
util living area	0.9998	0.9984	0.9901	0.9254	0.7439	0.5173	0.3698	0.4044	0.6438	0.9555	0.9986	0.9999 (86)
Living	20.5972	20.6909	20.8021	20.9245	20.9676	20.9723	20.9723	20.9724	20.9714	20.9119	20.7331	20.5861
Non living	19.8492	19.9451	20.0565	20.1786	20.2102	20.2265	20.2265	20.2294	20.2205	20.1734	20.0000	19.8482
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.7940	20.6909	20.8021	20.9245	20.9676	20.9723	20.9723	20.9724	20.9714	20.9119	20.7331	20.6440 (87)
Th 2	20.2180	20.2208	20.2236	20.2375	20.2402	20.2542	20.2542	20.2570	20.2486	20.2402	20.2347	20.2291 (88)
util rest of house	0.9997	0.9975	0.9845	0.8942	0.6871	0.4571	0.3071	0.3391	0.5747	0.9283	0.9976	0.9998 (89)
MIT 2	20.0293	19.9451	20.0565	20.1786	20.2102	20.2265	20.2265	20.2294	20.2205	20.1734	20.0000	19.9015 (90)
Living area fraction										FLA = Living area / (4) =		0.2145 (91)
MIT	20.1934	20.1051	20.2165	20.3386	20.3727	20.3865	20.3865	20.3888	20.3816	20.3319	20.1573	20.0608 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1934	20.1051	20.2165	20.3386	20.3727	20.3865	20.3865	20.3888	20.3816	20.3319	20.1573	20.0608 (93)

8. Space heating requirement

Utilisation	0.9997	0.9973	0.9845	0.8988	0.6972	0.4678	0.3182	0.3507	0.5870	0.9322	0.9975	Dec	0.9998 (94)
Useful gains	859.9347	1017.7417	1108.7902	1103.2477	887.7652	584.0421	382.2185	401.0148	638.5035	902.3194	859.8442	816.3923	(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	1688.3593	1609.0567	1445.9469	1182.5618	893.0792	584.1010	382.2191	401.0166	639.1887	1002.1512	1355.2131	1659.0881	(97)
Space heating kWh	616.3480	397.3637	250.8446	57.1062	3.9535	0.0000	0.0000	0.0000	0.0000	74.2749	356.6656	626.9657	(98a)
Space heating requirement - total per year (kWh/year)												2383.5221	
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	616.3480	397.3637	250.8446	57.1062	3.9535	0.0000	0.0000	0.0000	0.0000	74.2749	356.6656	626.9657	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2383.5221	
Space heating per m2										(98c) / (4) =		18.8674	(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 %)												393.2204 (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	616.3480	397.3637	250.8446	57.1062	3.9535	0.0000	0.0000	0.0000	0.0000	74.2749	356.6656	626.9657	(98)
Space heating efficiency (main heating system 1)	393.2204	393.2204	393.2204	393.2204	393.2204	0.0000	0.0000	0.0000	0.0000	393.2204	393.2204	393.2204	(210)
Space heating fuel (main heating system)	156.7436	101.0537	63.7924	14.5227	1.0054	0.0000	0.0000	0.0000	0.0000	18.8889	90.7037	159.4438	(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	279.9138	247.3589	262.2037	229.0194	221.0030	198.0430	194.5973	202.8988	205.7725	230.7831	247.0414	276.6471	(64)
Efficiency of water heater (217)m	188.2896	188.2896	188.2896	188.2896	188.2896	188.2896	188.2896	188.2896	188.2896	188.2896	188.2896	188.2896	(216)
Fuel for water heating, kWh/month	148.6614	131.3716	139.2556	121.6315	117.3740	105.1800	103.3500	107.7589	109.2851	122.5682	131.2029	146.9264	(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	30.0396	27.1325	30.0396	29.0705	30.0396	29.0705	30.0396	30.0396	29.0705	30.0396	29.0705	30.0396	(231)
Lighting	32.3447	25.9482	23.3634	17.1171	13.2217	10.8022	12.0613	15.6777	20.3638	26.7184	30.1784	33.2437	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-31.6432	-47.8362	-73.2620	-86.8087	-98.2902	-93.6876	-92.4816	-84.8718	-71.8509	-55.9569	-35.6996	-26.9766	(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												606.1543	(211)
Space heating fuel - main system 2												0.0000	(213)

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Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	188.2896
Water heating fuel used	1484.5656 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8820)	
mechanical ventilation fans (SFP = 0.8820)	353.6915 (230a)
Total electricity for the above, kWh/year	353.6915 (231)
Electricity for lighting (calculated in Appendix L)	261.0406 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-799.3652 (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	1906.0868 (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	606.1543	0.1583	95.9420 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1484.5656	0.1410	209.3692 (264)
Space and water heating			305.3112 (265)
Pumps, fans and electric keep-hot	353.6915	0.1387	49.0614 (267)
Energy for lighting	261.0406	0.1443	37.6762 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-799.3652	0.1333	-106.5860
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-106.5860 (269)
Total CO2, kg/year			285.4627 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.2600 (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	606.1543	1.5859	961.2963 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1484.5656	1.5215	2258.7466 (278)
Space and water heating			3220.0429 (279)
Pumps, fans and electric keep-hot	353.6915	1.5128	535.0646 (281)
Energy for lighting	261.0406	1.5338	400.3928 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-799.3652	1.4927	-1193.2334
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-1193.2334 (283)
Total Primary energy kWh/year			2962.2669 (286)
Dwelling Primary energy Rate (DPER)			23.4500 (287)

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

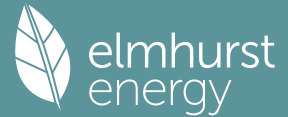
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	64.0200 (1b)	x 2.7400 (2b)	= 175.4148 (1b) - (3b)
First floor	62.3100 (1c)	x 2.4600 (2c)	= 153.2826 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	126.3300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n)	= 328.6974 (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	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	(6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 40.0000 / (5) = 0.1217 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3717 (18)
Number of sides sheltered	0 (19)

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Shelter factor
Infiltration rate adjusted to include shelter factor

$$(20) = 1 - [0.075 \times (19)] = 1.0000 \quad (20)$$

$$(21) = (18) \times (20) = 0.3717 \quad (21)$$

	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 infiltr rate	0.4739	0.4646	0.4553	0.4089	0.3996	0.3531	0.3531	0.3438	0.3717	0.3996	0.4182	0.4367	(22b)
Effective ac	0.6123	0.6079	0.6037	0.5836	0.5798	0.5623	0.5623	0.5591	0.5691	0.5798	0.5874	0.5954	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type			22.4700	1.1450	25.7290			(27)
Heatloss Floor 1			64.0200	0.1300	8.3226			(28a)
External Wall GF	176.7200	24.5700	152.1500	0.1800	27.3870			(29a)
External Roof 1	62.3100		62.3100	0.1100	6.8541			(30)
Flat Roof	1.7000		1.7000	0.1100	0.1870			(31)
Total net area of external elements Aum(A, m2)			304.7500					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	70.5797		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K

443.6779 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E5 Ground floor (normal)	34.7700	0.1600	5.5632	
E6 Intermediate floor within a dwelling	33.1800	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)	17.8100	0.0600	1.0686	
E12 Gable (insulation at ceiling level)	15.4100	0.0600	0.9246	
E16 Corner (normal)	36.6400	0.0900	3.2976	
E17 Corner (inverted - internal area greater than external area)	15.8600	-0.0900	-1.4274	
E2 Other lintels (including other steel lintels)	17.6500	0.0500	0.8825	
E3 Sill	13.9500	0.0500	0.6975	
E4 Jamb	25.1000	0.0500	1.2550	
E24 Eaves (insulation at ceiling level - inverted)	5.9200	0.2400	1.4208	
E14 Flat roof	3.0900	0.0800	0.2472	

Thermal bridges (Sum(L x Psi) calculated using Appendix K)

13.9296 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 84.5093 (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	66.4157	65.9427	65.4790	63.3014	62.8940	60.9974	60.9974	60.6462	61.7279	62.8940	63.7182	64.5799	(38)
Heat transfer coeff	150.9250	150.4520	149.9884	147.8107	147.4033	145.5067	145.5067	145.1555	146.2372	147.4033	148.2275	149.0892	(39)
Average = Sum(39)m / 12 =													147.8088

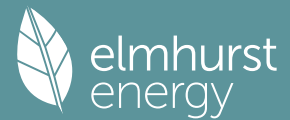
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1947	1.1909	1.1873	1.1700	1.1668	1.1518	1.1518	1.1490	1.1576	1.1668	1.1733	1.1802	(40)
HLP (average)													1.1700
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8848 (42)
Hot water usage for mixer showers													
72.5884	71.4976	69.9080	66.8665	64.6221	62.1190	60.6963	62.2739	64.0032	66.6907	69.7974	72.3103	(42a)	
Hot water usage for baths													
31.3386	30.8732	30.2178	29.0093	28.1044	27.1011	26.5591	27.2099	27.9186	28.9922	30.2255	31.2327	(42b)	
Hot water usage for other uses													
44.1732	42.5669	40.9606	39.3543	37.7480	36.1417	36.1417	37.7480	39.3543	40.9606	42.5669	44.1732	(42c)	
Average daily hot water use (litres/day)													136.1374 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
148.1003	144.9377	141.0864	135.2302	130.4745	125.3618	123.3971	127.2318	131.2761	136.6435	142.5899	147.7162	(44)	
Energy content	234.5546	206.3893	216.8445	185.1234	175.6438	154.1470	149.2381	157.5396	161.8765	185.4239	203.1454	231.2879	(45)
Energy content (annual)										Total = Sum(45)m =	2261.2140		
Distribution loss (46)m = 0.15 x (45)m													
35.1832	30.9584	32.5267	27.7685	26.3466	23.1220	22.3857	23.6309	24.2815	27.8136	30.4718	34.6932	(46)	
Water storage loss (or HIU loss):													
Store volume													180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.5520 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8381 (55)
Total storage loss													
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(56)	
If cylinder contains dedicated solar storage													
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
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													
283.7973	250.8666	266.0872	232.7776	224.8864	201.8012	198.4808	206.7822	209.5307	234.6666	250.7996	280.5305	(62)	
WWHRS	-33.1844	-29.3486	-30.7321	-25.4474	-23.7161	-20.2940	-19.0224	-20.2284	-20.9970	-24.7531	-28.0423	-32.5699	(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													
250.6129	221.5180	235.3550	207.3302	201.1704	181.5072	179.4584	186.5538	188.5337	209.9135	222.7574	247.9607	(64)	
Total per year (kWh/year)									Total per year (kWh/year) = Sum(64)m =	2532.6712	2533	(64)	
Electric shower(s)													0.0000 (64a)
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													
117.3835	104.2062	111.4949	99.6769	97.7957	89.3772	89.0158	91.7760	91.9473	101.0476	105.6692	116.2974	(65)	

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

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Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	144.2399	144.2399	144.2399	144.2399	144.2399	144.2399	144.2399	144.2399	144.2399	144.2399	144.2399	144.2399 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	151.3570	167.5738	151.3570	156.4022	151.3570	156.4022	151.3570	151.3570	156.4022	151.3570	156.4022	151.3570 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	293.2406	296.2835	288.6154	272.2911	251.6844	232.3171	219.3786	216.3357	224.0037	240.3281	260.9347	280.3020 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	37.4240	37.4240	37.4240	37.4240	37.4240	37.4240	37.4240	37.4240	37.4240	37.4240	37.4240	37.4240 (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)												
	-115.3919	-115.3919	-115.3919	-115.3919	-115.3919	-115.3919	-115.3919	-115.3919	-115.3919	-115.3919	-115.3919	-115.3919 (71)
Water heating gains (Table 5)												
	157.7736	155.0688	149.8588	138.4401	131.4458	124.1350	119.6449	123.3549	127.7046	135.8167	146.7628	156.3136 (72)
Total internal gains												
	671.6432	688.1981	659.1032	636.4054	603.7593	579.1264	556.6525	557.3195	574.3825	596.7738	633.3717	657.2447 (73)

6. Solar gains

[Jan]						Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
North						2.8000	10.6334		0.6300	0.7000	0.7700		9.0992 (74)	
South						11.1600	46.7521		0.6300	0.7000	0.7700		159.4545 (78)	
West						8.5100	19.6403		0.6300	0.7000	0.7700		51.0797 (80)	
Solar gains	219.6334	378.4572	526.7597	663.4308	749.8472	746.5757	718.9438	654.6854	574.4102	420.9360	263.9234	187.3744	(83)	
Total gains	891.2766	1066.6553	1185.8629	1299.8362	1353.6065	1325.7021	1275.5963	1212.0050	1148.7927	1017.7097	897.2952	844.6191	(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	103.1599	103.4842	103.8040	105.3333	105.6245	107.0012	107.0012	107.2602	106.4667	105.6245	105.0371	104.4301
alpha	7.8773	7.8989	7.9203	8.0222	8.0416	8.1334	8.1334	8.1507	8.0978	8.0416	8.0025	7.9620
util living area	0.9998	0.9991	0.9963	0.9776	0.8949	0.6901	0.5010	0.5490	0.8244	0.9872	0.9993	0.9999 (86)
MIT	20.1469	20.2894	20.4794	20.7281	20.9163	20.9914	20.9994	20.9988	20.9674	20.7225	20.3892	20.1293 (87)
Th 2	19.9243	19.9273	19.9302	19.9440	19.9466	19.9588	19.9588	19.9610	19.9541	19.9466	19.9414	19.9359 (88)
util rest of house	0.9997	0.9986	0.9938	0.9624	0.8360	0.5849	0.3830	0.4262	0.7264	0.9755	0.9987	0.9998 (89)
MIT 2	18.9385	19.1235	19.3681	19.6871	19.8901	19.9558	19.9587	19.9608	19.9395	19.6872	19.2630	18.9254 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.1978	19.3736	19.6065	19.9104	20.1102	20.1780	20.1819	20.1835	20.1600	19.9093	19.5046	19.1836 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.1978	19.3736	19.6065	19.9104	20.1102	20.1780	20.1819	20.1835	20.1600	19.9093	19.5046	19.1836 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9996	0.9982	0.9927	0.9618	0.8465	0.6078	0.4084	0.4527	0.7476	0.9750	0.9984	0.9997 (94)
Useful gains	890.9091	1064.7135	1177.1773	1250.1888	1145.8655	805.7493	520.9811	548.7172	858.8506	992.2318	895.8177	844.3914 (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	2248.4427	2177.5860	1965.8200	1627.4541	1239.6916	811.6346	521.1937	549.1914	886.1960	1372.2225	1838.6977	2233.8965 (97)
Space heating kWh	1010.0050	747.8503	586.7501	271.6310	69.8067	0.0000	0.0000	0.0000	0.0000	282.7131	678.8736	1033.7918 (98a)
Space heating requirement - total per year (kWh/year)	4681.4216											
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	1010.0050	747.8503	586.7501	271.6310	69.8067	0.0000	0.0000	0.0000	0.0000	282.7131	678.8736	1033.7918 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	4681.4216											
Space heating per m ²	(98c) / (4) = 37.0571 (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	1010.0050	747.8503	586.7501	271.6310	69.8067	0.0000	0.0000	0.0000	0.0000	282.7131	678.8736	1033.7918 (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)	1094.2633	810.2387	635.6989	294.2914	75.6302	0.0000	0.0000	0.0000	0.0000	306.2980	735.5077	1120.0345 (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	250.6129	221.5180	235.3550	207.3302	201.1704	181.5072	179.4584	186.5538	188.5337	209.9135	222.7574	247.9607 (64)
Efficiency of water heater	79.8000 (216)											
(217)m	86.8527	86.5689	86.0225	84.6665	81.9394	79.8000	79.8000	79.8000	79.8000	84.7282	86.3928	86.9039 (217)

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Fuel for water heating, kWh/month	288.5495	255.8864	273.5970	244.8785	245.5113	227.4526	224.8852	233.7767	236.2578	247.7494	257.8427	285.3274	(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	31.4490	25.2296	22.7164	16.6430	12.8555	10.5031	11.7273	15.2435	19.7998	25.9785	29.3426	32.3231	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-56.8330	-78.6027	-110.8382	-122.1327	-129.5682	-120.0927	-118.5011	-112.8349	-102.6277	-88.5904	-61.8945	-49.3067	(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	-36.9049	-77.0328	-152.0529	-226.9062	-298.6836	-299.7077	-296.2773	-251.5529	-185.2436	-109.7868	-49.1389	-29.2381	(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												5071.9627	(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												3021.7144	(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)												253.8114	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3164.3487	(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												5269.1398	(238)

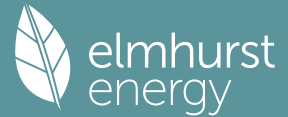
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	5071.9627	0.2100	1065.1122	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3021.7144	0.2100	634.5600	(264)
Space and water heating			1699.6722	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	253.8114	0.1443	36.6328	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1151.8230	0.1350	-155.5206	
PV Unit electricity exported	-2012.5258	0.1261	-253.7384	
Total			-409.2590	(269)
Total CO2, kg/year			1338.9752	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.6000	(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	5071.9627	1.1300	5731.3179	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3021.7144	1.1300	3414.5373	(278)
Space and water heating			9145.8552	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	253.8114	1.5338	389.3044	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1151.8230	1.4990	-1726.6290	
PV Unit electricity exported	-2012.5258	0.4628	-931.4100	
Total			-2658.0389	(283)
Total Primary energy kWh/year			7007.2214	(286)
Target Primary Energy Rate (TPER)			55.4700	(287)

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Plot Reference	4B6P	Issued on Date	08/04/2026
Assessment Reference	BeGreen	Plot Type Ref	
Plot Address	Trent, Land West of Gatesmead, Haywards Heath, RH161SN	SAP Version	10.2
SAP Rating	90 B	DER	2.24
Environmental	98 A	% DER < TER	78.00
CO ₂ Emissions (t/year)	0.21	DFEE	31.72
Compliance Check	See BREL	% DFEE < TFEE	13.57
% DPER < TPER	56.13	DPER	23.31
Assessor Details	Mr. Mirza Baig	Assessor ID	CK52-0001
Client			

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	53.1800 (1b)	x 2.7400 (2b)	= 145.7132 (1b) - (3b)
First floor	53.1800 (1c)	x 2.4600 (2c)	= 130.8228 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	106.3600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 276.5360 (5)

2. Ventilation rate

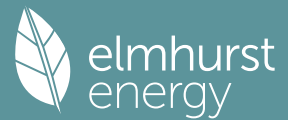
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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)
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	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (22b)
Balanced mechanical ventilation with heat recovery												
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)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.0000 (23c)
Effective ac	0.3312	0.3275	0.3237	0.3050	0.3013	0.2825	0.2825	0.2788	0.2900	0.3013	0.3087	0.3163 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Front Door			2.1000	1.0000	2.1000		(26)
Window			13.8400	1.0536	14.5824		(27)
Heatloss Floor 1			53.1800	0.1000	5.3180	110.0000	5849.8000 (28a)
External Wall GF	109.2500	15.9400	93.3100	0.1600	14.9296	190.0000	17728.9000 (29a)
External Roof 1	53.1800		53.1800	0.1000	5.3180	9.0000	478.6200 (30)
Total net area of external elements Aum(A, m ²)			215.6100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		42.2480		(33)
Main dwelling							
Party Wall 1			43.9400	0.0000	0.0000	140.0000	6151.5998 (32)
Internal Wall 1			259.5800			75.0000	19468.4990 (32c)
Internal Ceiling 1			53.1800			9.0000	478.6200 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 50156.0388 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							471.5686 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	21.0300	0.0560	1.1777
E6 Intermediate floor within a dwelling	21.0300	0.0050	0.1052
E10 Eaves (insulation at ceiling level)	8.4600	0.0500	0.4230
E12 Gable (insulation at ceiling level)	12.6000	0.0570	0.7182
E16 Corner (normal)	10.3900	0.0360	0.3740
E18 Party wall between dwellings	10.3900	0.0390	0.4052
E2 Other lintels (including other steel lintels)	11.4000	0.0620	0.7068
E3 Sill	8.6000	0.0390	0.3354
E4 Jamb	22.4000	0.0520	1.1648
P1 Party wall - Ground floor	8.4600	0.3200	2.7072
P4 Party wall - Roof (insulation at ceiling level)	8.4600	0.0420	0.3553
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.4728 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	50.7208 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	30.2288	29.8866	29.5444	27.8333	27.4911	25.7801	25.7801	25.4379	26.4645	27.4911	28.1756	28.8600	(38)
Heat transfer coeff	80.9496	80.6074	80.2652	78.5541	78.2119	76.5008	76.5008	76.1586	77.1853	78.2119	78.8963	79.5808	(39)
Average = Sum(39)m / 12 =												78.4686	
HLP	0.7611	0.7579	0.7547	0.7386	0.7354	0.7193	0.7193	0.7160	0.7257	0.7354	0.7418	0.7482	(40)
HLP (average)												0.7378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7911 (42)
Hot water usage for mixer showers	71.0177	69.9504	68.3952	65.4196	63.2237	60.7748	59.3829	60.9263	62.6182	65.2476	68.2871	70.7456	(42a)
Hot water usage for baths	30.6632	30.2078	29.5665	28.3841	27.4987	26.5169	25.9866	26.6234	27.3168	28.3673	29.5741	30.5595	(42b)
Hot water usage for other uses	43.2139	41.6424	40.0710	38.4996	36.9282	35.3568	35.3568	36.9282	38.4996	40.0710	41.6424	43.2139	(42c)
Average daily hot water use (litres/day)												133.1908	(43)
Daily hot water use	144.8947	141.8006	138.0327	132.3033	127.6506	122.6486	120.7263	124.4780	128.4347	133.6859	139.5036	144.5189	(44)
Energy conte	229.4778	201.9222	212.1512	181.1166	171.8422	150.8107	146.0081	154.1298	158.3728	181.4105	198.7485	226.2817	(45)
Energy content (annual)										Total = Sum(45)m =		2212.2721	
Distribution loss (46)m = 0.15 x (45)m	34.4217	30.2883	31.8227	27.1675	25.7763	22.6216	21.9012	23.1195	23.7559	27.2116	29.8123	33.9423	(46)
Water storage loss (or HIU loss):													
Store volume												180.0000	(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	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	274.8370	242.8918	257.5104	225.0126	217.2014	194.7067	191.3673	199.4890	202.2688	226.7697	242.6445	271.6409	(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	274.8370	242.8918	257.5104	225.0126	217.2014	194.7067	191.3673	199.4890	202.2688	226.7697	242.6445	271.6409	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2746.3401	(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	112.5887	99.9148	106.8276	95.3381	93.4249	85.2614	84.8350	87.5355	87.7757	96.6064	101.2007	111.5260	(65)

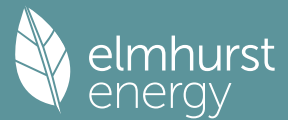
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	139.5560	139.5560	139.5560	139.5560	139.5560	139.5560	139.5560	139.5560	139.5560	139.5560	139.5560	139.5560	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	136.4721	151.0941	136.4721	141.0212	136.4721	141.0212	136.4721	136.4721	141.0212	136.4721	141.0212	136.4721	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	266.2188	268.9813	262.0199	247.1997	228.4920	210.9094	199.1631	196.4006	203.3620	218.1821	236.8899	254.4725	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.9556	36.9556	36.9556	36.9556	36.9556	36.9556	36.9556	36.9556	36.9556	36.9556	36.9556	36.9556	(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)	-111.6448	-111.6448	-111.6448	-111.6448	-111.6448	-111.6448	-111.6448	-111.6448	-111.6448	-111.6448	-111.6448	-111.6448	(71)
Water heating gains (Table 5)	151.3289	148.6828	143.5855	132.4140	125.5711	118.4186	114.0256	117.6552	121.9108	129.8473	140.5565	149.9006	(72)
Total internal gains	618.8866	633.6250	606.9443	585.5017	555.4020	535.2159	514.5276	515.3947	531.1608	549.3683	583.3343	605.7120	(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
South	5.6900	46.7521	0.4000	1.0000	0.7700	73.7405 (78)
West	8.1500	19.6403	0.4000	1.0000	0.7700	44.3709 (80)

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Solar gains	118.1114	207.5669	296.7824	382.3465	436.6793	435.9099	419.3666	379.3366	326.9523	233.2538	142.7330	100.2071 (83)
Total gains	736.9981	841.1919	903.7267	967.8482	992.0813	971.1258	933.8942	894.7313	858.1131	782.6221	726.0673	705.9191 (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	172.1099	172.8406	173.5775	177.3584	178.1344	182.1187	182.1187	182.9370	180.5038	178.1344	176.5891	175.0704
alpha	12.4740	12.5227	12.5718	12.8239	12.8756	13.1412	13.1412	13.1958	13.0336	12.8756	12.7726	12.6714
util living area												
	0.9998	0.9985	0.9904	0.9190	0.7295	0.5041	0.3604	0.3915	0.6202	0.9444	0.9983	0.9999 (86)
Living	20.6897	20.7626	20.8504	20.9473	20.9741	20.9762	20.9762	20.9763	20.9759	20.9412	20.8027	20.6822
Non living	20.0036	20.0788	20.1672	20.2650	20.2848	20.3001	20.3001	20.3030	20.2942	20.2646	20.1319	20.0065
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.8413	20.7626	20.8504	20.9473	20.9741	20.9762	20.9762	20.9763	20.9759	20.9412	20.8027	20.7267 (87)
Th 2	20.2872	20.2900	20.2928	20.3069	20.3097	20.3238	20.3238	20.3267	20.3182	20.3097	20.3041	20.2984 (88)
util rest of house												
	0.9996	0.9975	0.9847	0.8868	0.6773	0.4509	0.3050	0.3342	0.5592	0.9131	0.9970	0.9998 (89)
MIT 2	20.1421	20.0788	20.1672	20.2650	20.2848	20.3001	20.3001	20.3030	20.2942	20.2646	20.1319	20.0474 (90)
Living area fraction												
MIT	20.2762	20.2100	20.2982	20.3958	20.4170	20.4298	20.4298	20.4322	20.4249	20.3944	20.2605	20.1777 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2762	20.2100	20.2982	20.3958	20.4170	20.4298	20.4298	20.4322	20.4249	20.3944	20.2605	20.1777 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9996	0.9974	0.9848	0.8914	0.6855	0.4592	0.3137	0.3432	0.5688	0.9176	0.9969	0.9997 (94)
Useful gains	736.7131	838.9746	889.9541	862.7094	680.0586	445.9732	292.9806	307.0834	488.0558	718.1175	723.7867	705.7377 (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	1293.2685	1234.0957	1107.5163	903.0462	681.7715	445.9819	292.9806	307.0836	488.1909	766.0390	1038.3179	1271.5148 (97)
Space heating kWh	414.0773	265.5214	161.8662	29.0425	1.2744	0.0000	0.0000	0.0000	0.0000	35.6536	226.4625	420.9382 (98a)
Space heating requirement - total per year (kWh/year)												1554.8360
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	414.0773	265.5214	161.8662	29.0425	1.2744	0.0000	0.0000	0.0000	0.0000	35.6536	226.4625	420.9382 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1554.8360
Space heating per m2										(98c) / (4) =		14.6186 (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 %)												376.6741 (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	414.0773	265.5214	161.8662	29.0425	1.2744	0.0000	0.0000	0.0000	0.0000	35.6536	226.4625	420.9382 (98)
Space heating efficiency (main heating system 1)	376.6741	376.6741	376.6741	376.6741	376.6741	0.0000	0.0000	0.0000	0.0000	376.6741	376.6741	376.6741 (210)
Space heating fuel (main heating system)	109.9298	70.4910	42.9725	7.7102	0.3383	0.0000	0.0000	0.0000	0.0000	9.4654	60.1216	111.7513 (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	274.8370	242.8918	257.5104	225.0126	217.2014	194.7067	191.3673	199.4890	202.2688	226.7697	242.6445	271.6409 (64)
Efficiency of water heater (217)m	190.9694	190.9694	190.9694	190.9694	190.9694	190.9694	190.9694	190.9694	190.9694	190.9694	190.9694	190.9694 (216)
Fuel for water heating, kWh/month	143.9168	127.1889	134.8438	117.8265	113.7363	101.9570	100.2083	104.4612	105.9168	118.7466	127.0593	142.2432 (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	25.2725	22.8268	25.2725	24.4573	25.2725	24.4573	25.2725	25.2725	24.4573	25.2725	24.4573	25.2725 (231)
Lighting	28.1776	22.6051	20.3534	14.9118	11.5183	9.4105	10.5074	13.6579	17.7402	23.2761	26.2903	28.9607 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-31.1089	-46.7985	-71.3939	-84.4095	-95.5441	-90.9950	-89.8178	-82.6051	-70.1568	-54.7208	-35.0194	-26.5504 (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												412.7801 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)

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Efficiency of water heater	190.9694	
Water heating fuel used	1438.1048	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8820)		
mechanical ventilation fans (SFP = 0.8820)	297.5638	(230a)
Total electricity for the above, kWh/year	297.5638	(231)
Electricity for lighting (calculated in Appendix L)	227.4093	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-779.1202	(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	1596.7377	(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	412.7801	0.1587	65.5002 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1438.1048	0.1410	202.8027 (264)
Space and water heating			268.3030 (265)
Pumps, fans and electric keep-hot	297.5638	0.1387	41.2758 (267)
Energy for lighting	227.4093	0.1443	32.8222 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-779.1202	0.1334	-103.9219
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-103.9219 (269)
Total CO2, kg/year			238.4790 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.2400 (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	412.7801	1.5874	655.2348 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1438.1048	1.5214	2188.0044 (278)
Space and water heating			2843.2392 (279)
Pumps, fans and electric keep-hot	297.5638	1.5128	450.1545 (281)
Energy for lighting	227.4093	1.5338	348.8080 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-779.1202	1.4929	-1163.1450
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-1163.1450 (283)
Total Primary energy kWh/year			2479.0566 (286)
Dwelling Primary energy Rate (DPER)			23.3100 (287)

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

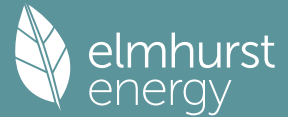
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	53.1800 (1b)	x 2.7400 (2b)	= 145.7132 (1b) - (3b)
First floor	53.1800 (1c)	x 2.4600 (2c)	= 130.8228 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	106.3600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n)	= 276.5360 (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	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1446 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3946 (18)
Number of sides sheltered	0 (19)

Full SAP Calculation Printout



Shelter factor
Infiltration rate adjusted to include shelter factor

$$(20) = 1 - [0.075 \times (19)] = 1.0000 \quad (20)$$
$$(21) = (18) \times (20) = 0.3946 \quad (21)$$

	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													
Effective ac	0.5032	0.4933	0.4834	0.4341	0.4242	0.3749	0.3749	0.3650	0.3946	0.4242	0.4440	0.4637	(22b)
	0.6266	0.6217	0.6169	0.5942	0.5900	0.5703	0.5703	0.5666	0.5779	0.5900	0.5986	0.6075	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type			13.8400	1.1450	15.8473			(27)
Heatloss Floor 1			53.1800	0.1300	6.9134			(28a)
External Wall GF	109.2500	15.9400	93.3100	0.1800	16.7958			(29a)
External Roof 1	53.1800		53.1800	0.1100	5.8498			(30)
Total net area of external elements Aum(A, m2)			215.6100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.5063			(33)
Main dwelling								
Party Wall 1			43.9400	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							471.5686	(35)

List of Thermal Bridges
K1 Element
E5 Ground floor (normal)
E6 Intermediate floor within a dwelling
E10 Eaves (insulation at ceiling level)
E12 Gable (insulation at ceiling level)
E16 Corner (normal)
E18 Party wall between dwellings
E2 Other lintels (including other steel lintels)
E3 Sill
E4 Jamb
P1 Party wall - Ground floor
P4 Party wall - Roof (insulation at ceiling level)

Length	Psi-value	Total
21.0300	0.1600	3.3648
21.0300	0.0000	0.0000
8.4600	0.0600	0.5076
12.6000	0.0600	0.7560
10.3900	0.0900	0.9351
10.3900	0.0600	0.6234
11.4000	0.0500	0.5700
8.6000	0.0500	0.4300
22.4000	0.0500	1.1200
8.4600	0.0800	0.6768
8.4600	0.1200	1.0152

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Point Thermal bridges
Total fabric heat loss
(33) + (36) + (36a) = 57.5052 (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	57.1809	56.7323	56.2926	54.2272	53.8408	52.0420	52.0420	51.7089	52.7349	53.8408	54.6225	55.4398	(38)
Heat transfer coeff	114.6861	114.2375	113.7978	111.7325	111.3461	109.5472	109.5472	109.2141	110.2401	111.3461	112.1278	112.9450	(39)
Average = Sum(39)m / 12 =												111.7306	

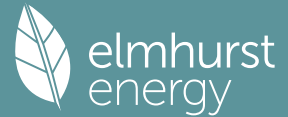
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0783	1.0741	1.0699	1.0505	1.0469	1.0300	1.0300	1.0268	1.0365	1.0469	1.0542	1.0619	(40)
HLP (average)												1.0505	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7911	(42)
Hot water usage for mixer showers														
71.0177	69.9504	68.3952	65.4196	63.2237	60.7748	59.3829	60.9263	62.6182	65.2476	68.2871	70.7456		(42a)	
Hot water usage for baths														
30.6632	30.2078	29.5665	28.3841	27.4987	26.5169	25.9866	26.6234	27.3168	28.3673	29.5741	30.5595		(42b)	
Hot water usage for other uses														
43.2139	41.6424	40.0710	38.4996	36.9282	35.3568	35.3568	36.9282	38.4996	40.0710	41.6424	43.2139		(42c)	
Average daily hot water use (litres/day)													133.1908	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use														
144.8947	141.8006	138.0327	132.3033	127.6506	122.6486	120.7263	124.4780	128.4347	133.6859	139.5036	144.5189		(44)	
Energy content	229.4778	201.9222	212.1512	181.1166	171.8422	150.8107	146.0081	154.1298	158.3728	181.4105	198.7485	226.2817		(45)
Energy content (annual)										Total = Sum(45)m =		2212.2721		
Distribution loss (46)m = 0.15 x (45)m														
34.4217	30.2883	31.8227	27.1675	25.7763	22.6216	21.9012	23.1195	23.7559	27.2116	29.8123	33.9423		(46)	
Water storage loss (or HIU loss):														
Store volume													180.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):													1.5520	(48)
Temperature factor from Table 2b													0.5400	(49)
Enter (49) or (54) in (55)													0.8381	(55)
Total storage loss														
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803		(56)	
If cylinder contains dedicated solar storage														
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803		(57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	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		(61)	
Total heat required for water heating calculated for each month														
278.7205	246.3995	261.3939	228.7708	221.0849	198.4649	195.2507	203.3724	206.0270	230.6532	246.4027	275.5244		(62)	
WWHRS	-32.4663	-28.7135	-30.0671	-24.8968	-23.2029	-19.8549	-18.6108	-19.7907	-20.5426	-24.2175	-27.4355		(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		(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		(63c)	
FGHRS	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														
246.2541	217.6860	231.3267	203.8741	197.8820	178.6101	176.6399	183.5817	185.4844	206.4357	218.9672	243.6593		(64)	
12Total per year (kWh/year)													2490.4013	(64)
Electric shower(s)													2490	(64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000	(64a)
Heat gains from water heating, kWh/month														
115.6955	102.7209	109.9344	98.3446	96.5317	88.2679	87.9418	90.6423	90.7823	99.7131	104.2072	114.6328		(65)	

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

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Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	139.5560	139.5560	139.5560	139.5560	139.5560	139.5560	139.5560	139.5560	139.5560	139.5560	139.5560	139.5560 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	146.3897	162.0743	146.3897	151.2693	146.3897	151.2693	146.3897	146.3897	151.2693	146.3897	151.2693	146.3897 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	266.2188	268.9813	262.0199	247.1997	228.4920	210.9094	199.1631	196.4006	203.3620	218.1821	236.8899	254.4725 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	36.9556	36.9556	36.9556	36.9556	36.9556	36.9556	36.9556	36.9556	36.9556	36.9556	36.9556	36.9556 (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)												
	-111.6448	-111.6448	-111.6448	-111.6448	-111.6448	-111.6448	-111.6448	-111.6448	-111.6448	-111.6448	-111.6448	-111.6448 (71)
Water heating gains (Table 5)												
	155.5047	152.8585	147.7613	136.5898	129.7469	122.5943	118.2014	121.8310	126.0865	134.0230	144.7323	154.0764 (72)
Total internal gains												
	635.9800	651.7809	624.0376	602.9256	572.4954	549.6398	528.6209	529.4881	545.5847	566.4616	600.7583	622.8054 (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
South					5.6900	46.7521	0.6300	0.7000			0.7700			81.2989 (78)
West					8.1500	19.6403	0.6300	0.7000			0.7700			48.9189 (80)
Solar gains	130.2178	228.8425	327.2026	421.5371	481.4389	480.5907	462.3517	418.2186	360.4649	257.1623	157.3631			110.4783 (83)
Total gains	766.1978	880.6234	951.2402	1024.4627	1053.9342	1030.2305	990.9726	947.7066	906.0496	823.6240	758.1214			733.2836 (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	121.4815	121.9585	122.4297	124.6928	125.1255	127.1801	127.1801	127.5681	126.3808	125.1255	124.2532	123.3541
alpha	9.0988	9.1306	9.1620	9.3129	9.3417	9.4787	9.4787	9.5045	9.4254	9.3417	9.2835	9.2236
util living area												
	0.9999	0.9994	0.9973	0.9806	0.8951	0.6748	0.4861	0.5295	0.8086	0.9877	0.9994	0.9999 (86)
MIT	20.3137	20.4269	20.5807	20.7919	20.9448	20.9964	20.9998	20.9997	20.9832	20.7935	20.5204	20.3034 (87)
Th 2	20.0186	20.0221	20.0255	20.0415	20.0445	20.0584	20.0584	20.0610	20.0530	20.0445	20.0384	20.0321 (88)
util rest of house												
	0.9998	0.9990	0.9953	0.9667	0.8374	0.5790	0.3823	0.4218	0.7144	0.9760	0.9988	0.9998 (89)
MIT 2	19.2241	19.3721	19.5711	19.8458	20.0087	20.0573	20.0584	20.0610	20.0461	19.8539	19.5055	19.2221 (90)
Living area fraction												
	19.4331	19.5744	19.7647	20.0273	20.1882	20.2374	20.2390	20.2410	20.2259	20.0341	19.7002	19.4295 (92)
MIT	19.4331	19.5744	19.7647	20.0273	20.1882	20.2374	20.2390	20.2410	20.2259	20.0341	19.7002	19.4295 (92)
Temperature adjustment												
	19.4331	19.5744	19.7647	20.0273	20.1882	20.2374	20.2390	20.2410	20.2259	20.0341	19.7002	19.4295 (93)
adjusted MIT	19.4331	19.5744	19.7647	20.0273	20.1882	20.2374	20.2390	20.2410	20.2259	20.0341	19.7002	19.4295 (93)

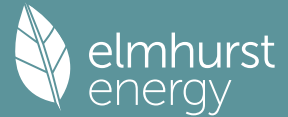
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9997	0.9987	0.9946	0.9664	0.8473	0.5976	0.4022	0.4425	0.7329	0.9758	0.9986	0.9998 (94)
Useful gains	765.9463	879.4509	946.0769	990.0711	892.9697	615.6221	398.5980	419.3927	664.0154	803.6847	757.0334	733.1220 (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												
	1735.5570	1676.3637	1509.4965	1243.2781	945.1301	617.5663	398.6405	419.4938	675.3168	1050.4543	1412.8305	1720.0991 (97)
Space heating kWh												
	721.3903	535.5254	419.1842	182.3090	38.8074	0.0000	0.0000	0.0000	0.0000	183.5966	472.1739	734.3110 (98a)
Space heating requirement - total per year (kWh/year)												3287.2978
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												
	721.3903	535.5254	419.1842	182.3090	38.8074	0.0000	0.0000	0.0000	0.0000	183.5966	472.1739	734.3110 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3287.2978
Space heating per m ²												(98c) / (4) = 30.9073 (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												
	721.3903	535.5254	419.1842	182.3090	38.8074	0.0000	0.0000	0.0000	0.0000	183.5966	472.1739	734.3110 (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)												
	781.5713	580.2009	454.1540	197.5179	42.0448	0.0000	0.0000	0.0000	0.0000	198.9129	511.5644	795.5698 (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												
	246.2541	217.6860	231.3267	203.8741	197.8820	178.6101	176.6399	183.5817	185.4844	206.4357	218.9672	243.6593 (64)
Efficiency of water heater												
	86.3224	85.9969	85.3759	83.8100	81.1485	79.8000	79.8000	79.8000	79.8000	83.7978	85.7365	79.8000 (216)
(217)m												
	86.3224	85.9969	85.3759	83.8100	81.1485	79.8000	79.8000	79.8000	79.8000	83.7978	85.7365	86.3730 (217)
Fuel for water heating, kWh/month												

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	285.2726	253.1323	270.9509	243.2576	243.8518	223.8221	221.3533	230.0523	232.4365	246.3497	255.3955	282.1013	(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	30.4169	24.4016	21.9709	16.0968	12.4336	10.1584	11.3424	14.7433	19.1500	25.1259	28.3796	31.2623	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-48.4058	-67.5486	-96.0888	-106.8433	-114.1620	-106.1289	-104.7737	-99.4099	-89.8065	-76.6523	-52.9539	-41.9280	(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	-29.4602	-61.7344	-122.2891	-183.0957	-241.5773	-242.5900	-239.7735	-203.2790	-149.3218	-88.1353	-39.2792	-23.3175	(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												3561.5361	(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												2987.9759	(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)												245.4817	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2628.5548	(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												4252.4390	(238)

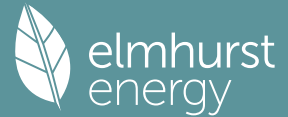
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3561.5361	0.2100	747.9226 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2987.9759	0.2100	627.4749 (264)
Space and water heating			1375.3975 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	245.4817	0.1443	35.4306 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1004.7016	0.1348	-135.4581
PV Unit electricity exported	-1623.8531	0.1260	-204.5799
Total			-340.0380 (269)
Total CO2, kg/year			1082.7193 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.1800 (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	3561.5361	1.1300	4024.5358 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2987.9759	1.1300	3376.4128 (278)
Space and water heating			7400.9486 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	245.4817	1.5338	376.5280 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1004.7016	1.4983	-1505.3454
PV Unit electricity exported	-1623.8531	0.4625	-750.9548
Total			-2256.3003 (283)
Total Primary energy kWh/year			5651.2771 (286)
Target Primary Energy Rate (TPER)			53.1300 (287)

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Plot Reference	4B8P	Issued on Date	08/04/2026
Assessment Reference	BeGreen	Plot Type Ref	
Plot Address	Midhurst, Land West of Gatesmead, Haywards Heath, RH161SN	SAP Version	10.2
SAP Rating	89 B	DER	2.27
Environmental	98 A	% DER < TER	79.02
CO ₂ Emissions (t/year)	0.29	DFEE	38.93
Compliance Check	See BREL	% DFEE < TFEE	17.13
% DPER < TPER	58.66	DPER	23.52
Assessor Details	Mr. Mirza Baig	Assessor ID	CK52-0001
Client			

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	77.5400 (1b)	x 2.7400 (2b)	= 212.4596 (1b) - (3b)
First floor	64.8400 (1c)	x 2.4600 (2c)	= 159.5064 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	142.3800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 371.9660 (5)

2. Ventilation rate

	m ³ 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)
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	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (22b)
Balanced mechanical ventilation with heat recovery												
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)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.0000 (23c)
Effective ac	0.3312	0.3275	0.3237	0.3050	0.3013	0.2825	0.2825	0.2788	0.2900	0.3013	0.3087	0.3163 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Front Door			2.1000	1.0000	2.1000		(26)
Window			29.2400	1.0536	30.8084		(27)
Heatloss Floor 1			77.5400	0.1000	7.7540	110.0000	8529.4000 (28a)
External Wall GF	196.0900	31.3400	164.7500	0.1600	26.3600	190.0000	31302.4993 (29a)
External Roof 1	64.8400		64.8400	0.1000	6.4840	9.0000	583.5600 (30)
Flat Roof	12.7000		12.7000	0.1000	1.2700	9.0000	114.3000 (30)
Total net area of external elements Aum(A, m ²)			351.1700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	74.7764		(33)
Main dwelling							
Internal Wall 1			287.3000			75.0000	21547.4991 (32c)
Internal Ceiling 1			64.8400			9.0000	583.5600 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	62660.8184 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							440.0957 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	42.4400	0.0560	2.3766
E6 Intermediate floor within a dwelling	32.5200	0.0050	0.1626
E10 Eaves (insulation at ceiling level)	18.5400	0.0500	0.9270
E12 Gable (insulation at ceiling level)	14.1200	0.0570	0.8048
E16 Corner (normal)	39.9400	0.0360	1.4378
E17 Corner (inverted - internal area greater than external area)	19.1600	-0.0900	-1.7244
E2 Other lintels (including other steel lintels)	21.8000	0.0620	1.3516
E3 Sill	17.4000	0.0390	0.6786
E4 Jamb	55.6000	0.0520	2.8912
E24 Eaves (insulation at ceiling level - inverted)	10.8200	0.0750	0.8115
E14 Flat roof	7.8000	0.0700	0.5460
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			10.2634 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	85.0398 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.6605	40.2002	39.7399	37.4384	36.9781	34.6765	34.6765	34.2162	35.5971	36.9781	37.8987	38.8193	(38)
Heat transfer coeff	125.7004	125.2401	124.7798	122.4782	122.0179	119.7164	119.7164	119.2561	120.6370	122.0179	122.9385	123.8591	(39)
Average = Sum(39)m / 12 =												122.3631	
HLP	0.8829	0.8796	0.8764	0.8602	0.8570	0.8408	0.8408	0.8376	0.8473	0.8570	0.8635	0.8699	(40)
HLP (average)												0.8594	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9215 (42)
Hot water usage for mixer showers	73.2035	72.1034	70.5003	67.4331	65.1696	62.6454	61.2106	62.8016	64.5455	67.2558	70.3889	72.9230	(42a)
Hot water usage for baths	31.6031	31.1338	30.4728	29.2542	28.3416	27.3298	26.7833	27.4396	28.1542	29.2369	30.4807	31.4963	(42b)
Hot water usage for other uses	44.5489	42.9290	41.3090	39.6890	38.0691	36.4491	36.4491	38.0691	39.6890	41.3090	42.9290	44.5489	(42c)
Average daily hot water use (litres/day)												137.2913	(43)
Daily hot water use	149.3556	146.1661	142.2822	136.3764	131.5804	126.4243	124.4430	128.3102	132.3888	137.8017	143.7985	148.9682	(44)
Energy conte	236.5427	208.1386	218.6824	186.6924	177.1325	155.4535	150.5030	158.8748	163.2486	186.9956	204.8673	233.2483	(45)
Energy content (annual)										Total = Sum(45)m =		2280.3796	
Distribution loss (46)m = 0.15 x (45)m	35.4814	31.2208	32.8024	28.0039	26.5699	23.3180	22.5755	23.8312	24.4873	28.0493	30.7301	34.9872	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8100	(55)
Total storage loss	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	(56)
If cylinder contains dedicated solar storage	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	(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	284.9151	251.8298	267.0548	233.5044	225.5049	202.2655	198.8754	207.2472	210.0606	235.3680	251.6793	281.6207	(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	284.9151	251.8298	267.0548	233.5044	225.5049	202.2655	198.8754	207.2472	210.0606	235.3680	251.6793	281.6207	(64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2849.9256	(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	117.3484	104.1591	111.4098	99.5248	97.5945	89.1379	88.7402	91.5238	91.7297	100.8740	105.5680	116.2530	(65)

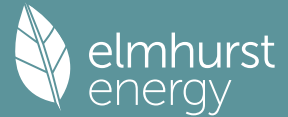
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	146.0742	146.0742	146.0742	146.0742	146.0742	146.0742	146.0742	146.0742	146.0742	146.0742	146.0742	146.0742	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	157.4197	174.2861	157.4197	162.6670	157.4197	162.6670	157.4197	157.4197	162.6670	157.4197	162.6670	157.4197	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	312.1022	315.3408	307.1795	289.8051	267.8731	247.2600	233.4893	230.2506	238.4119	255.7863	277.7184	298.3314	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6074	37.6074	37.6074	37.6074	37.6074	37.6074	37.6074	37.6074	37.6074	37.6074	37.6074	37.6074	(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)	-116.8593	-116.8593	-116.8593	-116.8593	-116.8593	-116.8593	-116.8593	-116.8593	-116.8593	-116.8593	-116.8593	-116.8593	(71)
Water heating gains (Table 5)	157.7263	154.9986	149.7444	138.2289	131.1754	123.8026	119.2744	123.0159	127.4024	135.5833	146.6222	156.2540	(72)
Total internal gains	694.0704	711.4477	681.1659	657.5233	623.2904	600.5519	577.0057	577.5084	595.3036	615.6115	653.8298	678.8273	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
East	16.2600	19.6403	0.4000	1.0000	0.7700	88.5240 (76)
South	4.3300	46.7521	0.4000	1.0000	0.7700	56.1154 (78)

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West	8.6500		19.6403		0.4000		1.0000		0.7700		47.0930 (80)	
Solar gains	191.7324	357.1982	553.9718	769.5105	918.7880	932.0892	890.7068	779.6440	630.4286	413.9212	235.6144	160.0137 (83)
Total gains	885.8028	1068.6460	1235.1376	1427.0338	1542.0784	1532.6412	1467.7125	1357.1525	1225.7322	1029.5327	889.4442	838.8410 (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	138.4704	138.9793	139.4920	142.1133	142.6494	145.3918	145.3918	145.9530	144.2823	142.6494	141.5812	140.5288
alpha	10.2314	10.2653	10.2995	10.4742	10.5100	10.6928	10.6928	10.7302	10.6188	10.5100	10.4387	10.3686
util living area	0.9999	0.9993	0.9937	0.9290	0.7279	0.4998	0.3589	0.4042	0.6755	0.9770	0.9995	1.0000 (86)
Living	20.5281	20.6245	20.7579	20.9133	20.9658	20.9707	20.9708	20.9709	20.9690	20.8743	20.6712	20.5175
Non living	19.7476	19.8463	19.9807	20.1344	20.1726	20.1889	20.1889	20.1918	20.1827	20.1075	19.9057	19.7470
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.7586	20.6245	20.7579	20.9133	20.9658	20.9707	20.9708	20.9709	20.9690	20.8743	20.6712	20.5850 (87)
Th 2	20.1821	20.1849	20.1876	20.2014	20.2042	20.2181	20.2181	20.2209	20.2125	20.2042	20.1987	20.1931 (88)
util rest of house	0.9999	0.9989	0.9899	0.8983	0.6694	0.4388	0.2951	0.3357	0.6005	0.9598	0.9991	0.9999 (89)
MIT 2	19.9598	19.8463	19.9807	20.1344	20.1726	20.1889	20.1889	20.1918	20.1827	20.1075	19.9057	19.8094 (90)
Living area fraction									FLA = Living area / (4) =			0.2214 (91)
MIT	20.1367	20.0186	20.1528	20.3068	20.3482	20.3620	20.3620	20.3643	20.3568	20.2773	20.0752	19.9811 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1367	20.0186	20.1528	20.3068	20.3482	20.3620	20.3620	20.3643	20.3568	20.2773	20.0752	19.9811 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9999	0.9988	0.9897	0.9028	0.6802	0.4500	0.3069	0.3483	0.6144	0.9618	0.9990	0.9999 (94)
Useful gains	885.6788	1067.3323	1222.4221	1288.3925	1048.9750	689.7292	450.3740	472.7608	753.1052	990.1873	888.5583	838.7667 (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	1990.6759	1893.4567	1703.5875	1397.0829	1055.2353	689.8037	450.3750	472.7646	754.7956	1180.7990	1595.1483	1954.6346 (97)
Space heating kWh	822.1179	555.1556	357.9870	78.2571	4.6576	0.0000	0.0000	0.0000	0.0000	141.8151	508.7448	830.2057 (98a)
Space heating requirement - total per year (kWh/year)												3298.9408
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	822.1179	555.1556	357.9870	78.2571	4.6576	0.0000	0.0000	0.0000	0.0000	141.8151	508.7448	830.2057 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3298.9408
Space heating per m2										(98c) / (4) =		23.1700 (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 %)												421.1637 (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	822.1179	555.1556	357.9870	78.2571	4.6576	0.0000	0.0000	0.0000	0.0000	141.8151	508.7448	830.2057 (98)
Space heating efficiency (main heating system 1)	421.1637	421.1637	421.1637	421.1637	421.1637	0.0000	0.0000	0.0000	0.0000	421.1637	421.1637	421.1637 (210)
Space heating fuel (main heating system)	195.2015	131.8147	84.9995	18.5812	1.1059	0.0000	0.0000	0.0000	0.0000	33.6722	120.7950	197.1218 (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	284.9151	251.8298	267.0548	233.5044	225.5049	202.2655	198.8754	207.2472	210.0606	235.3680	251.6793	281.6207 (64)
Efficiency of water heater (217)m	190.6288	190.6288	190.6288	190.6288	190.6288	190.6288	190.6288	190.6288	190.6288	190.6288	190.6288	190.6288 (216)
Fuel for water heating, kWh/month	149.4607	132.1048	140.0916	122.4917	118.2953	106.1044	104.3260	108.7177	110.1935	123.4693	132.0259	147.7325 (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	33.9939	30.7041	33.9939	32.8973	33.9939	32.8973	33.9939	33.9939	32.8973	33.9939	32.8973	33.9939 (231)
Lighting	35.5794	28.5431	25.6999	18.8289	14.5440	11.8825	13.2675	17.2456	22.4003	29.3904	33.1964	36.5683 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-31.9828	-48.5665	-74.5538	-88.2475	-99.9718	-95.3751	-94.1605	-86.2929	-72.9071	-56.8984	-36.1722	-27.2416 (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												783.2918 (211)
Space heating fuel - main system 2												0.0000 (213)

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Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	190.6288
Water heating fuel used	1495.0135 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8820)	
mechanical ventilation fans (SFP = 0.8820)	400.2503 (230a)
Total electricity for the above, kWh/year	400.2503 (231)
Electricity for lighting (calculated in Appendix L)	287.1465 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-812.3701 (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	2153.3319 (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	783.2918	0.1579	123.6665	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1495.0135	0.1410	210.8050	(264)
Space and water heating			334.4715	(265)
Pumps, fans and electric keep-hot	400.2503	0.1387	55.5196	(267)
Energy for lighting	287.1465	0.1443	41.4441	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-812.3701	0.1333	-108.3031	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-108.3031	(269)
Total CO2, kg/year			323.1322	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.2700	(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	783.2918	1.5844	1241.0714	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1495.0135	1.5214	2274.5018	(278)
Space and water heating			3515.5733	(279)
Pumps, fans and electric keep-hot	400.2503	1.5128	605.4986	(281)
Energy for lighting	287.1465	1.5338	440.4348	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-812.3701	1.4926	-1212.5829	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1212.5829	(283)
Total Primary energy kWh/year			3348.9238	(286)
Dwelling Primary energy Rate (DPER)			23.5200	(287)

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

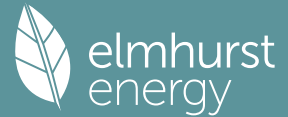
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	77.5400 (1b)	x 2.7400 (2b)	= 212.4596 (1b) - (3b)	
First floor	64.8400 (1c)	x 2.4600 (2c)	= 159.5064 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	142.3800			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n)	= 371.9660	(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	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1075 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3575	(18)
Number of sides sheltered	0	(19)

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Shelter factor
Infiltration rate adjusted to include shelter factor

$$(20) = 1 - [0.075 \times (19)] = 1.0000 \quad (20)$$

$$(21) = (18) \times (20) = 0.3575 \quad (21)$$

	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 infiltr rate	0.4559	0.4469	0.4380	0.3933	0.3844	0.3397	0.3397	0.3307	0.3575	0.3844	0.4022	0.4201	(22b)
Effective ac	0.6039	0.5999	0.5959	0.5773	0.5739	0.5577	0.5577	0.5547	0.5639	0.5739	0.5809	0.5882	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type			29.2400	1.1450	33.4809			(27)
Heatloss Floor 1			77.5400	0.1300	10.0802			(28a)
External Wall GF	196.0900	31.3400	164.7500	0.1800	29.6550			(29a)
External Roof 1	64.8400		64.8400	0.1100	7.1324			(30)
Flat Roof	12.7000		12.7000	0.1100	1.3970			(30)
Total net area of external elements Aum(A, m2)			351.1700					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	83.8455		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K

440.0957 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E5 Ground floor (normal)	42.4400	0.1600	6.7904	
E6 Intermediate floor within a dwelling	32.5200	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)	18.5400	0.0600	1.1124	
E12 Gable (insulation at ceiling level)	14.1200	0.0600	0.8472	
E16 Corner (normal)	39.9400	0.0900	3.5946	
E17 Corner (inverted - internal area greater than external area)	19.1600	-0.0900	-1.7244	
E2 Other lintels (including other steel lintels)	21.8000	0.0500	1.0900	
E3 Sill	17.4000	0.0500	0.8700	
E4 Jamb	55.6000	0.0500	2.7800	
E24 Eaves (insulation at ceiling level - inverted)	10.8200	0.2400	2.5968	
E14 Flat roof	7.8000	0.0800	0.6240	

Thermal bridges (Sum(L x Psi) calculated using Appendix K)

18.5810 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 102.4265 (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	74.1285	73.6332	73.1478	70.8676	70.4410	68.4551	68.4551	68.0873	69.2200	70.4410	71.3040	72.2063	(38)
Heat transfer coeff	176.5550	176.0597	175.5743	173.2941	172.8675	170.8816	170.8816	170.5138	171.6465	172.8675	173.7305	174.6328	(39)
Average = Sum(39)m / 12 =													173.2921

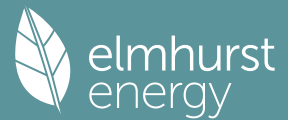
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2400	1.2365	1.2331	1.2171	1.2141	1.2002	1.2002	1.1976	1.2056	1.2141	1.2202	1.2265	(40)
HLP (average)												1.2171	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9215 (42)
Hot water usage for mixer showers	73.2035	72.1034	70.5003	67.4331	65.1696	62.6454	61.2106	62.8016	64.5455	67.2558	70.3889	72.9230	(42a)
Hot water usage for baths	31.6031	31.1338	30.4728	29.2542	28.3416	27.3298	26.7833	27.4396	28.1542	29.2369	30.4807	31.4963	(42b)
Hot water usage for other uses	44.5489	42.9290	41.3090	39.6890	38.0691	36.4491	36.4491	38.0691	39.6890	41.3090	42.9290	44.5489	(42c)
Average daily hot water use (litres/day)													137.2913 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	149.3556	146.1661	142.2822	136.3764	131.5804	126.4243	124.4430	128.3102	132.3888	137.8017	143.7985	148.9682	(44)
Energy content (annual)	236.5427	208.1386	218.6824	186.6924	177.1325	155.4535	150.5030	158.8748	163.2486	186.9956	204.8673	233.2483	(45)
Distribution loss (46)m = 0.15 x (45)m	35.4814	31.2208	32.8024	28.0039	26.5699	23.3180	22.5755	23.8312	24.4873	28.0493	30.7301	34.9872	(46)
Water storage loss (or HIU loss):													
Store volume													200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6525 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8924 (55)
Total storage loss	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(56)
If cylinder contains dedicated solar storage	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(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													
WWHRS	287.4688	254.1364	269.6085	235.9757	228.0585	204.7367	201.4291	209.8009	212.5319	237.9217	254.1506	284.1743	(62)
PV diverter	-33.4656	-29.5972	-30.9925	-25.6630	-23.9170	-20.4660	-19.1836	-20.3998	-21.1749	-24.9629	-28.2799	-32.8459	(63a)
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	(63b)
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	(63c)
Output from w/h	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)
	254.0032	224.5391	238.6159	210.3127	204.1415	184.2708	182.2455	189.4011	191.3570	212.9588	225.8707	251.3285	(64)
12Total per year (kWh/year)													2569.0448 (64)
Electric shower(s)													2569 (64)
	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)
													0.0000 (64a)
Heat gains from water heating, kWh/month													
	119.3913	106.0043	113.4527	101.5019	99.6374	91.1149	90.7831	93.5667	93.7068	102.9169	107.5450	118.2959	(65)

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

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Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	146.0742	146.0742	146.0742	146.0742	146.0742	146.0742	146.0742	146.0742	146.0742	146.0742	146.0742	146.0742 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	158.1280	175.0703	158.1280	163.3989	158.1280	163.3989	158.1280	158.1280	163.3989	158.1280	163.3989	158.1280 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	312.1022	315.3408	307.1795	289.8051	267.8731	247.2600	233.4893	230.2506	238.4119	255.7863	277.7184	298.3314 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	37.6074	37.6074	37.6074	37.6074	37.6074	37.6074	37.6074	37.6074	37.6074	37.6074	37.6074	37.6074 (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)												
	-116.8593	-116.8593	-116.8593	-116.8593	-116.8593	-116.8593	-116.8593	-116.8593	-116.8593	-116.8593	-116.8593	-116.8593 (71)
Water heating gains (Table 5)												
	160.4722	157.7445	152.4903	140.9748	133.9212	126.5485	122.0203	125.7618	130.1483	138.3292	149.3681	158.9999 (72)
Total internal gains												
	700.5246	717.9778	687.6200	664.0011	629.7446	604.0297	580.4598	580.9626	598.7814	622.0657	660.3076	685.2815 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a		g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d	Gains W	
East				16.2600	19.6403		0.6300	0.7000		0.7700	97.5977 (76)	
South				4.3300	46.7521		0.6300	0.7000		0.7700	61.8672 (78)	
West				8.6500	19.6403		0.6300	0.7000		0.7700	51.9201 (80)	
Solar gains	211.3850	393.8111	610.7539	848.3853	1012.9638	1027.6284	982.0043	859.5575	695.0475	456.3481	259.7648	176.4151 (83)
Total gains	911.9096	1111.7889	1298.3739	1512.3865	1642.7084	1631.6581	1562.4641	1440.5202	1293.8289	1078.4138	920.0725	861.6966 (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	98.5856	98.8629	99.1363	100.4407	100.6886	101.8587	101.8587	102.0784	101.4048	100.6886	100.1884	99.6708
alpha	7.5724	7.5909	7.6091	7.6960	7.7126	7.7906	7.7906	7.8052	7.7603	7.7126	7.6792	7.6447
util living area												
	0.9999	0.9995	0.9971	0.9761	0.8755	0.6602	0.4804	0.5423	0.8430	0.9921	0.9996	0.9999 (86)
MIT	20.0520	20.1975	20.4171	20.7103	20.9208	20.9923	20.9994	20.9985	20.9563	20.6602	20.3025	20.0340 (87)
Th 2	19.8881	19.8909	19.8936	19.9063	19.9087	19.9199	19.9199	19.9219	19.9156	19.9087	19.9039	19.8988 (88)
util rest of house												
	0.9998	0.9992	0.9951	0.9600	0.8110	0.5545	0.3630	0.4166	0.7453	0.9845	0.9993	0.9999 (89)
MIT 2	18.7889	18.9776	19.2602	19.6336	19.8568	19.9173	19.9198	19.9217	19.8952	19.5807	19.1227	18.7743 (90)
Living area fraction												
	fLA = Living area / (4) =											
MIT	19.0685	19.2477	19.5163	19.8719	20.0923	20.1553	20.1588	20.1601	20.1301	19.8197	19.3839	19.0532 (92)
Temperature adjustment												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
adjusted MIT												
	19.0685	19.2477	19.5163	19.8719	20.0923	20.1553	20.1588	20.1601	20.1301	19.8197	19.3839	19.0532 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9998	0.9989	0.9941	0.9593	0.8233	0.5782	0.3891	0.4446	0.7670	0.9836	0.9991	0.9999 (94)
Useful gains	911.7016	1110.5616	1290.7234	1450.8238	1352.4471	943.4087	607.8915	640.5048	992.3664	1060.6814	919.2536	861.5704 (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												
	2607.4551	2526.0506	2285.3356	1901.3715	1450.7631	949.2966	608.1299	641.1468	1035.0440	1593.7889	2134.0875	2593.8499 (97)
Space heating kWh												
	1261.6406	951.2086	739.9915	324.3943	73.1471	0.0000	0.0000	0.0000	0.0000	396.6320	874.6804	1288.8160 (98a)
Space heating requirement - total per year (kWh/year)												
	5910.5106	5910.5106	5910.5106	5910.5106	5910.5106	5910.5106	5910.5106	5910.5106	5910.5106	5910.5106	5910.5106	5910.5106
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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Space heating kWh												
	1261.6406	951.2086	739.9915	324.3943	73.1471	0.0000	0.0000	0.0000	0.0000	396.6320	874.6804	1288.8160 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												
	5910.5106	5910.5106	5910.5106	5910.5106	5910.5106	5910.5106	5910.5106	5910.5106	5910.5106	5910.5106	5910.5106	5910.5106
Space heating per m ²												
	(98c) / (4) =	(98c) / (4) =	(98c) / (4) =	(98c) / (4) =	(98c) / (4) =	(98c) / (4) =	(98c) / (4) =	(98c) / (4) =	(98c) / (4) =	(98c) / (4) =	(98c) / (4) =	41.5122 (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												
	1261.6406	951.2086	739.9915	324.3943	73.1471	0.0000	0.0000	0.0000	0.0000	396.6320	874.6804	1288.8160 (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)												
	1366.8913	1030.5619	801.7243	351.4565	79.2493	0.0000	0.0000	0.0000	0.0000	429.7205	947.6494	1396.3337 (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												
	254.0032	224.5391	238.6159	210.3127	204.1415	184.2708	182.2455	189.4011	191.3570	212.9588	225.8707	251.3285 (64)
Efficiency of water heater												
	87.1527	86.9277	86.4234	85.0282	81.9921	79.8000	79.8000	79.8000	79.8000	85.4339	86.7911	87.1952 (217)

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Fuel for water heating, kWh/month	291.4460	258.3056	276.1012	247.3447	248.9769	230.9158	228.3778	237.3447	239.7957	249.2673	260.2465	288.2365	(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	7.0685	7.3041	7.0685	7.3041	7.0685	(231)
Lighting	32.8559	26.3582	23.7326	17.3875	13.4306	10.9730	12.2519	15.9255	20.6856	27.1406	30.6553	33.7690	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-66.4249	-90.6864	-126.2494	-137.2779	-144.1182	-133.0186	-131.2135	-125.6434	-115.4359	-101.2768	-71.8971	-57.7678	(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	-47.1089	-97.8168	-192.1601	-285.4724	-374.5736	-375.4370	-371.1595	-315.6972	-233.2293	-138.9946	-62.5849	-37.3645	(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												6403.5868	(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												3056.3588	(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)												265.1657	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3832.6088	(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												5978.5025	(238)

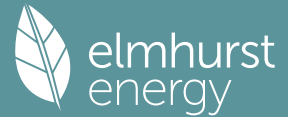
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	6403.5868	0.2100	1344.7532	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3056.3588	0.2100	641.8353	(264)
Space and water heating			1986.5886	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	265.1657	0.1443	38.2716	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1301.0100	0.1353	-176.0360	
PV Unit electricity exported	-2531.5988	0.1262	-319.5208	
Total			-495.5568	(269)
Total CO2, kg/year			1541.2326	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.8200	(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	6403.5868	1.1300	7236.0531	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3056.3588	1.1300	3453.6854	(278)
Space and water heating			10689.7385	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	265.1657	1.5338	406.7201	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1301.0100	1.5001	-1951.6614	
PV Unit electricity exported	-2531.5988	0.4633	-1172.8956	
Total			-3124.5570	(283)
Total Primary energy kWh/year			8102.0024	(286)
Target Primary Energy Rate (TPER)			56.9000	(287)

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Plot Reference	5B9P				Issued on Date	08/04/2026	
Assessment Reference	BeGreen			Plot Type Ref			
Plot Address	Whitchurch, Land West of Gatesmead, Haywards Heath, RH161SN				SAP Version	10.2	
SAP Rating	89 B	DER	2.20	TER	10.11		
Environmental	98 A	% DER < TER				78.24	
CO ₂ Emissions (t/year)	0.35	DFEE	38.95	TFEE	45.56		
Compliance Check	See BREL	% DFEE < TFEE				14.50	
% DPER < TPER	57.18	DPER	22.82	TPER	53.28		
Assessor Details	Mr. Mirza Baig				Assessor ID	CK52-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	90.5900 (1b)	x 2.7400 (2b)	= 248.2166 (1b) - (3b)
First floor	89.2600 (1c)	x 2.4600 (2c)	= 219.5796 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	179.8500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 467.7962 (5)

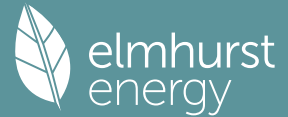
2. Ventilation rate

	m ³ 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)											
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	3.0000 (17)											
Infiltration rate	0.1500 (18)											
Number of sides sheltered	0 (19)											
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)											
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (21)											
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (22b)
Balanced mechanical ventilation with heat recovery												
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)											
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	71.2000 (23c)											
Effective ac	0.3352	0.3315	0.3277	0.3090	0.3052	0.2865	0.2865	0.2827	0.2940	0.3052	0.3127	0.3202 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Front Door			2.1000	1.0000	2.1000		(26)
Window			27.6800	1.0536	29.1648		(27)
Heatloss Floor 1			90.5900	0.1000	9.0590	110.0000	9964.9000 (28a)
External Wall GF	208.0700	29.7800	178.2900	0.1600	28.5264	190.0000	33875.1014 (29a)
External Roof 1	89.2600		89.2600	0.1000	8.9260	9.0000	803.3400 (30)
Flat Roof	1.3300		1.3300	0.1000	0.1330	9.0000	11.9700 (30)
Total net area of external elements Aum(A, m ²)			389.2500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		77.9092		(33)
Main dwelling							
Internal Wall 1			316.1000			75.0000	23707.5005 (32c)
Internal Ceiling 1			89.2600			9.0000	803.3400 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	69166.1518 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							384.5769 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	40.6300	0.0560	2.2753
E6 Intermediate floor within a dwelling	30.5400	0.0050	0.1527
E10 Eaves (insulation at ceiling level)	30.5400	0.0500	1.5270
E12 Gable (insulation at ceiling level)	8.4600	0.0570	0.4822
E16 Corner (normal)	31.4500	0.0360	1.1322
E17 Corner (inverted - internal area greater than external area)	10.6700	-0.0900	-0.9603
E2 Other lintels (including other steel lintels)	20.9500	0.0620	1.2989
E3 Sill	16.0500	0.0390	0.6260
E4 Jamb	46.6000	0.0520	2.4232
E24 Eaves (insulation at ceiling level - inverted)	4.4000	0.0750	0.3300
E14 Flat roof	3.0900	0.0700	0.2163
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.5034 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	87.4126 (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	51.7535	51.1746	50.5957	47.7012	47.1223	44.2278	44.2278	43.6489	45.3856	47.1223	48.2801	49.4379	(38)
Heat transfer coeff	139.1661	138.5872	138.0083	135.1138	134.5349	131.6404	131.6404	131.0615	132.7982	134.5349	135.6927	136.8505	(39)
Average = Sum(39)m / 12 =												134.9691	
HLP	0.7738	0.7706	0.7674	0.7513	0.7480	0.7319	0.7319	0.7287	0.7384	0.7480	0.7545	0.7609	(40)
HLP (average)												0.7505	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9756 (42)
Hot water usage for mixer showers	74.1112	72.9974	71.3745	68.2693	65.9777	63.4221	61.9696	63.5802	65.3458	68.0897	71.2616	73.8272	(42a)
Hot water usage for baths	31.9934	31.5183	30.8492	29.6155	28.6917	27.6674	27.1141	27.7785	28.5019	29.5980	30.8571	31.8853	(42b)
Hot water usage for other uses	45.1033	43.4632	41.8231	40.1829	38.5428	36.9027	36.9027	38.5428	40.1829	41.8231	43.4632	45.1033	(42c)
Average daily hot water use (litres/day)												138.9940	(43)
Daily hot water use	151.2079	147.9789	144.0467	138.0677	133.2122	127.9922	125.9863	129.9015	134.0307	139.5108	145.5819	150.8158	(44)
Energy conte	239.4764	210.7200	221.3945	189.0077	179.3292	157.3813	152.3696	160.8452	165.2732	189.3148	207.4081	236.1411	(45)
Energy content (annual)										Total = Sum(45)m =		2308.6612	
Distribution loss (46)m = 0.15 x (45)m	35.9215	31.6080	33.2092	28.3512	26.8994	23.6072	22.8554	24.1268	24.7910	28.3972	31.1112	35.4212	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8100	(55)
Total storage loss	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	(56)
If cylinder contains dedicated solar storage	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	(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	287.8488	254.4112	269.7669	235.8197	227.7016	204.1933	200.7420	209.2176	212.0852	237.6872	254.2201	284.5135	(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	287.8488	254.4112	269.7669	235.8197	227.7016	204.1933	200.7420	209.2176	212.0852	237.6872	254.2201	284.5135	(64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2878.2072	(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	118.3238	105.0174	112.3116	100.2947	98.3249	89.7789	89.3608	92.1790	92.4030	101.6451	106.4128	117.2148	(65)

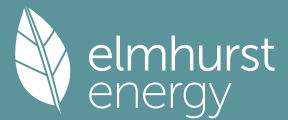
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	148.7809	148.7809	148.7809	148.7809	148.7809	148.7809	148.7809	148.7809	148.7809	148.7809	148.7809	148.7809	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	177.3392	196.3399	177.3392	183.2505	177.3392	183.2505	177.3392	177.3392	183.2505	177.3392	183.2505	177.3392	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	351.4669	355.1141	345.9234	326.3576	301.6593	278.4464	262.9388	259.2916	268.4823	288.0481	312.7464	335.9593	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.8781	37.8781	37.8781	37.8781	37.8781	37.8781	37.8781	37.8781	37.8781	37.8781	37.8781	37.8781	(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)	-119.0247	-119.0247	-119.0247	-119.0247	-119.0247	-119.0247	-119.0247	-119.0247	-119.0247	-119.0247	-119.0247	-119.0247	(71)
Water heating gains (Table 5)	159.0374	156.2758	150.9564	139.2982	132.1571	124.6929	120.1086	123.8965	128.3374	136.6197	147.7956	157.5468	(72)
Total internal gains	755.4778	775.3640	741.8533	716.5406	678.7899	654.0241	628.0209	628.1616	647.7045	669.6413	711.4267	738.4796	(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	11.6300	10.6334	0.4000	1.0000	0.7700	34.2803 (74)
East	4.0500	19.6403	0.4000	1.0000	0.7700	22.0493 (76)

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West	12.0000		19.6403		0.4000		1.0000		0.7700		65.3314 (80)	
Solar gains	121.6610	236.4466	392.8259	589.3680	744.0275	772.9297	731.1127	612.2190	461.2457	280.8118	151.2427	100.4354 (83)
Total gains	877.1388	1011.8107	1134.6792	1305.9086	1422.8174	1426.9539	1359.1335	1240.3806	1108.9502	950.4531	862.6694	838.9150 (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	138.0568	138.6335	139.2150	142.1973	142.8092	145.9493	145.9493	146.5939	144.6768	142.8092	141.5907	140.3928
alpha	10.2038	10.2422	10.2810	10.4798	10.5206	10.7300	10.7300	10.7729	10.6451	10.5206	10.4394	10.3595
util living area	1.0000	0.9998	0.9987	0.9793	0.8439	0.5896	0.4261	0.4859	0.8052	0.9944	0.9998	1.0000 (86)
Living	20.4928	20.5676	20.6835	20.8526	20.9537	20.9705	20.9709	20.9710	20.9629	20.8203	20.6321	20.4881
Non living	19.8021	19.8794	19.9977	20.1750	20.2600	20.2835	20.2836	20.2866	20.2747	20.1487	19.9567	19.8076
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.7405	20.5676	20.6835	20.8526	20.9537	20.9705	20.9709	20.9710	20.9629	20.8203	20.6321	20.5597 (87)
Th 2	20.2761	20.2789	20.2817	20.2958	20.2986	20.3127	20.3127	20.3155	20.3071	20.2986	20.2930	20.2873 (88)
util rest of house	1.0000	0.9997	0.9980	0.9682	0.7941	0.5268	0.3596	0.4137	0.7349	0.9901	0.9997	1.0000 (89)
MIT 2	20.0336	19.8794	19.9977	20.1750	20.2600	20.2835	20.2836	20.2866	20.2747	20.1487	19.9567	19.8747 (90)
Living area fraction									FLA = Living area / (4) =			0.2088 (91)
MIT	20.1812	20.0231	20.1409	20.3165	20.4048	20.4269	20.4271	20.4295	20.4184	20.2889	20.0977	20.0177 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1812	20.0231	20.1409	20.3165	20.4048	20.4269	20.4271	20.4295	20.4184	20.2889	20.0977	20.0177 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	1.0000	0.9997	0.9978	0.9686	0.8021	0.5372	0.3707	0.4257	0.7468	0.9900	0.9997	1.0000 (94)
Useful gains	877.0964	1011.5089	1132.1968	1264.8591	1141.2143	766.6067	503.7962	528.0767	828.1543	940.9250	862.4170	838.8871 (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	2210.1246	2095.8699	1882.5504	1542.5255	1171.1045	767.0613	503.8037	528.1073	839.0687	1303.4959	1763.6909	2164.6587 (97)
Space heating kWh	991.7730	728.6906	558.2631	199.9198	22.2383	0.0000	0.0000	0.0000	0.0000	269.7527	648.9172	986.3741 (98a)
Space heating requirement - total per year (kWh/year)												4405.9288
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	991.7730	728.6906	558.2631	199.9198	22.2383	0.0000	0.0000	0.0000	0.0000	269.7527	648.9172	986.3741 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4405.9288
Space heating per m2										(98c) / (4) =		24.4978 (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 %)												425.0691 (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	991.7730	728.6906	558.2631	199.9198	22.2383	0.0000	0.0000	0.0000	0.0000	269.7527	648.9172	986.3741 (98)
Space heating efficiency (main heating system 1)	425.0691	425.0691	425.0691	425.0691	425.0691	0.0000	0.0000	0.0000	0.0000	425.0691	425.0691	425.0691 (210)
Space heating fuel (main heating system)	233.3204	171.4287	131.3347	47.0323	5.2317	0.0000	0.0000	0.0000	0.0000	63.4609	152.6616	232.0503 (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	287.8488	254.4112	269.7669	235.8197	227.7016	204.1933	200.7420	209.2176	212.0852	237.6872	254.2201	284.5135 (64)
Efficiency of water heater (217)m	190.2730	190.2730	190.2730	190.2730	190.2730	190.2730	190.2730	190.2730	190.2730	190.2730	190.2730	190.2730 (216)
Fuel for water heating, kWh/month	151.2820	133.7085	141.7789	123.9376	119.6710	107.3160	105.5021	109.9566	111.4637	124.9191	133.6081	149.5291 (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	50.2163	45.3567	50.2163	48.5965	50.2163	48.5965	50.2163	50.2163	48.5965	50.2163	48.5965	50.2163 (231)
Lighting	42.2139	33.8655	30.4922	22.3399	17.2560	14.0983	15.7415	20.4613	26.5773	34.8708	39.3865	43.3871 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-32.4433	-49.6762	-77.0819	-92.0433	-103.8376	-99.0482	-97.8205	-89.3889	-75.1907	-58.7109	-36.8448	-27.5933 (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												1036.5207 (211)
Space heating fuel - main system 2												0.0000 (213)

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Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	190.2730
Water heating fuel used	1512.6728 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.0360)	
mechanical ventilation fans (SFP = 1.0360)	591.2570 (230a)
Total electricity for the above, kWh/year	591.2570 (231)
Electricity for lighting (calculated in Appendix L)	340.6902 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-839.6797 (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	2641.4609 (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	1036.5207	0.1568	162.4770 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1512.6728	0.1410	213.3036 (264)
Space and water heating			375.7806 (265)
Pumps, fans and electric keep-hot	591.2570	0.1387	82.0146 (267)
Energy for lighting	340.6902	0.1443	49.1721 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-839.6797	0.1332	-111.8734
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-111.8734 (269)
Total CO2, kg/year			395.0940 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.2000 (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	1036.5207	1.5803	1638.0377 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1512.6728	1.5214	2301.4004 (278)
Space and water heating			3939.4381 (279)
Pumps, fans and electric keep-hot	591.2570	1.5128	894.4535 (281)
Energy for lighting	340.6902	1.5338	522.5621 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-839.6797	1.4923	-1253.0840
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-1253.0840 (283)
Total Primary energy kWh/year			4103.3698 (286)
Dwelling Primary energy Rate (DPER)			22.8200 (287)

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

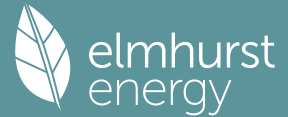
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	90.5900 (1b)	x 2.7400 (2b)	= 248.2166 (1b) - (3b)
First floor	89.2600 (1c)	x 2.4600 (2c)	= 219.5796 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	179.8500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n)	= 467.7962 (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	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	(6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 40.0000 / (5) = 0.0855 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3355 (18)
Number of sides sheltered	0 (19)

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Shelter factor
Infiltration rate adjusted to include shelter factor

$$(20) = 1 - [0.075 \times (19)] = 1.0000 \quad (20)$$
$$(21) = (18) \times (20) = 0.3355 \quad (21)$$

	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 infiltr rate	0.4278	0.4194	0.4110	0.3691	0.3607	0.3187	0.3187	0.3103	0.3355	0.3607	0.3774	0.3942	(22b)
Effective ac	0.5915	0.5879	0.5845	0.5681	0.5650	0.5508	0.5508	0.5482	0.5563	0.5650	0.5712	0.5777	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type			27.6800	1.1450	31.6947			(27)
Heatloss Floor 1			90.5900	0.1300	11.7767			(28a)
External Wall GF	208.0700	29.7800	178.2900	0.1800	32.0922			(29a)
External Roof 1	89.2600		89.2600	0.1100	9.8186			(30)
Flat Roof	1.3300		1.3300	0.1100	0.1463			(30)
Total net area of external elements Aum(A, m2)			389.2500					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	87.6285		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K

384.5769 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E5 Ground floor (normal)	40.6300	0.1600	6.5008	
E6 Intermediate floor within a dwelling	30.5400	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)	30.5400	0.0600	1.8324	
E12 Gable (insulation at ceiling level)	8.4600	0.0600	0.5076	
E16 Corner (normal)	31.4500	0.0900	2.8305	
E17 Corner (inverted - internal area greater than external area)	10.6700	-0.0900	-0.9603	
E2 Other lintels (including other steel lintels)	20.9500	0.0500	1.0475	
E3 Sill	16.0500	0.0500	0.8025	
E4 Jamb	46.6000	0.0500	2.3300	
E24 Eaves (insulation at ceiling level - inverted)	4.4000	0.2400	1.0560	
E14 Flat roof	3.0900	0.0800	0.2472	

Thermal bridges (Sum(L x Psi) calculated using Appendix K)

16.1942 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 103.8227 (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	91.3106	90.7621	90.2245	87.6995	87.2270	85.0277	85.0277	84.6205	85.8749	87.2270	88.1828	89.1819	(38)
Heat transfer coeff	195.1333	194.5848	194.0472	191.5221	191.0497	188.8504	188.8504	188.4431	189.6975	191.0497	192.0054	193.0046	(39)
Average = Sum(39)m / 12 =												191.5198	

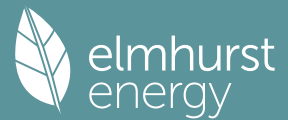
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0850	1.0819	1.0789	1.0649	1.0623	1.0500	1.0500	1.0478	1.0548	1.0623	1.0676	1.0731	(40)
HLP (average)												1.0649	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9756 (42)
Hot water usage for mixer showers													
74.1112	72.9974	71.3745	68.2693	65.9777	63.4221	61.9696	63.5802	65.3458	68.0897	71.2616	73.8272	73.8272	(42a)
Hot water usage for baths													
31.9934	31.5183	30.8492	29.6155	28.6917	27.6674	27.1141	27.7785	28.5019	29.5980	30.8571	31.8853	31.8853	(42b)
Hot water usage for other uses													
45.1033	43.4632	41.8231	40.1829	38.5428	36.9027	36.9027	38.5428	40.1829	41.8231	43.4632	45.1033	45.1033	(42c)
Average daily hot water use (litres/day)													138.9940 (43)
Daily hot water use													
151.2079	147.9789	144.0467	138.0677	133.2122	127.9922	125.9863	129.9015	134.0307	139.5108	145.5819	150.8158	150.8158	(44)
Energy conte	239.4764	210.7200	221.3945	189.0077	179.3292	157.3813	152.3696	160.8452	165.2732				(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
35.9215	31.6080	33.2092	28.3512	26.8994	23.6072	22.8554	24.1268	24.7910	28.3972	31.1112	35.4212	35.4212	(46)
Water storage loss (or HIU loss):													
Store volume													200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6525 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8924 (55)
Total storage loss													
27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	(56)
If cylinder contains dedicated solar storage													
27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	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													
290.4025	256.7177	272.3205	238.2910	230.2553	206.6646	203.2956	211.7713	214.5565	240.2409	256.6914	287.0672	287.0672	(62)
WWHRS	-33.8805	-29.9642	-31.3768	-25.9812	-24.2136	-20.7197	-19.4214	-20.6528	-21.4374	-25.2724	-28.6305	-33.2531	(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													
256.5219	226.7535	240.9437	212.3098	206.0417	185.9449	183.8742	191.1186	193.1191	214.9685	228.0609	253.8141	253.8141	(64)
12Total per year (kWh/year)													2593.4709 (64)
Electric shower(s)													2593 (64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month													
120.3668	106.8626	114.3545	102.2717	100.3678	91.7559	91.4037	94.2219	94.3800	103.6880	108.3898	119.2578	119.2578	(65)

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

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Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	148.7809	148.7809	148.7809	148.7809	148.7809	148.7809	148.7809	148.7809	148.7809	148.7809	148.7809	148.7809
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	186.3996	206.3710	186.3996	192.6129	186.3996	192.6129	186.3996	186.3996	192.6129	186.3996	192.6129	186.3996
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	351.4669	355.1141	345.9234	326.3576	301.6593	278.4464	262.9388	259.2916	268.4823	288.0481	312.7464	335.9593
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	37.8781	37.8781	37.8781	37.8781	37.8781	37.8781	37.8781	37.8781	37.8781	37.8781	37.8781	37.8781
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
Losses e.g. evaporation (negative values) (Table 5)												
	-119.0247	-119.0247	-119.0247	-119.0247	-119.0247	-119.0247	-119.0247	-119.0247	-119.0247	-119.0247	-119.0247	-119.0247
Water heating gains (Table 5)												
	161.7833	159.0217	153.7023	142.0440	134.9030	127.4388	122.8545	126.6423	131.0833	139.3656	150.5414	160.2927
Total internal gains												
	770.2841	791.1410	756.6596	731.6488	693.5962	666.1324	639.8271	639.9678	659.8128	684.4475	726.5350	753.2858

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
North					11.6300	10.6334		0.6300	0.7000	0.7700		37.7940 (74)	
East					4.0500	19.6403		0.6300	0.7000	0.7700		24.3094 (76)	
West					12.0000	19.6403		0.6300	0.7000	0.7700		72.0278 (80)	
Solar gains	134.1313	260.6824	433.0905	649.7782	820.2903	852.1550	806.0517	674.9715	508.5234	309.5950	166.7450	110.7300	(83)
Total gains	904.4153	1051.8234	1189.7501	1381.4271	1513.8865	1518.2874	1445.8788	1314.9393	1168.3361	994.0426	893.2800	864.0159	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	98.4600	98.7375	99.0111	100.3165	100.5645	101.7357	101.7357	101.9555	101.2813	100.5645	100.0640	99.5459
alpha	7.5640	7.5825	7.6007	7.6878	7.7043	7.7824	7.7824	7.7970	7.7521	7.7043	7.6709	7.6364
util living area												
	1.0000	0.9998	0.9992	0.9923	0.9427	0.7643	0.5714	0.6503	0.9293	0.9976	0.9998	1.0000
MIT	20.0074	20.1222	20.3144	20.5999	20.8522	20.9795	20.9980	20.9950	20.9056	20.5792	20.2497	19.9957
Th 2	20.0131	20.0156	20.0181	20.0296	20.0318	20.0418	20.0418	20.0437	20.0380	20.0318	20.0274	20.0228
util rest of house												
	0.9999	0.9997	0.9987	0.9872	0.9060	0.6660	0.4491	0.5206	0.8689	0.9954	0.9997	1.0000
MIT 2	18.8436	18.9929	19.2411	19.6131	19.9123	20.0329	20.0415	20.0426	19.9775	19.5909	19.1658	18.8363
Living area fraction												
	19.0866	19.2287	19.4652	19.8191	20.1085	20.2305	20.2412	20.2414	20.1713	19.7972	19.3921	19.0783
Temperature adjustment												
	19.0866	19.2287	19.4652	19.8191	20.1085	20.2305	20.2412	20.2414	20.1713	19.7972	19.3921	19.0783

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9999	0.9996	0.9982	0.9856	0.9096	0.6866	0.4748	0.5481	0.8793	0.9946	0.9996	0.9999
Useful gains	904.3194	1051.4196	1187.6315	1361.5353	1377.0125	1042.4889	686.5235	720.7769	1027.3091	988.6450	892.9581	863.9531
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
Heat loss rate W												
	2885.3497	2788.1388	2515.8620	2091.2543	1606.4494	1063.3296	687.6345	723.8917	1151.7100	1757.1311	2360.1426	2871.5868
Space heating kWh												
	1473.8866	1167.0753	988.2035	525.3977	170.7010	0.0000	0.0000	0.0000	0.0000	571.7536	1056.3728	1493.6795
Space heating requirement - total per year (kWh/year)												
	1473.8866	1167.0753	988.2035	525.3977	170.7010	0.0000	0.0000	0.0000	0.0000	571.7536	1056.3728	1493.6795
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
Solar heating contribution - total per year (kWh/year)												
	1473.8866	1167.0753	988.2035	525.3977	170.7010	0.0000	0.0000	0.0000	0.0000	571.7536	1056.3728	1493.6795
Space heating requirement after solar contribution - total per year (kWh/year)												
	1473.8866	1167.0753	988.2035	525.3977	170.7010	0.0000	0.0000	0.0000	0.0000	571.7536	1056.3728	1493.6795
Space heating per m ²												
										(98c) / (4) =		

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

Fraction of space heat from secondary/supplementary system (Table 11)												
												0.0000
Fraction of space heat from main system(s)												
												1.0000
Efficiency of main space heating system 1 (in %)												
												92.3000
Efficiency of main space heating system 2 (in %)												
												0.0000
Efficiency of secondary/supplementary heating system, %												
												0.0000
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement												
	1473.8866	1167.0753	988.2035	525.3977	170.7010	0.0000	0.0000	0.0000	0.0000	571.7536	1056.3728	1493.6795
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
Space heating fuel (main heating system)												
	1596.8435	1264.4369	1070.6430	569.2283	184.9415	0.0000	0.0000	0.0000	0.0000	619.4514	1144.4993	1618.2877
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
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
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
Water heating requirement												
	256.5219	226.7535	240.9437	212.3098	206.0417	185.9449	183.8742	191.1186	193.1191	214.9685	228.0609	253.8141
Efficiency of water heater												
	87.3397	87.2001	86.8793	86.0083	83.6410	79.8000	79.8000	79.8000	79.8000	86.1452	87.0567	87.3688

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Fuel for water heating, kWh/month	293.7058	260.0382	277.3317	246.8480	246.3407	233.0137	230.4188	239.4969	242.0039	249.5419	261.9683	290.5088	(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	38.7302	31.0708	27.9758	20.4963	15.8319	12.9348	14.4424	18.7728	24.3840	31.9931	36.1361	39.8066	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-76.7527	-104.3482	-144.6305	-156.5045	-163.6266	-150.7334	-148.6606	-142.6853	-131.6276	-116.1615	-82.9085	-66.8006	(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	-55.8889	-115.8801	-227.3674	-337.3949	-442.3611	-443.2953	-438.2618	-372.9331	-275.7179	-164.5476	-74.2068	-44.3425	(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												8068.3317	(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												3071.2167	(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)												312.5745	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-4477.6375	(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												7060.4853	(238)

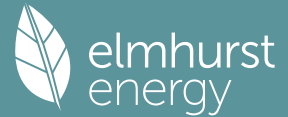
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	8068.3317	0.2100	1694.3497	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3071.2167	0.2100	644.9555	(264)
Space and water heating			2339.3051	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	312.5745	0.1443	45.1142	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1485.4399	0.1354	-201.1480	
PV Unit electricity exported	-2992.1976	0.1262	-377.7519	
Total			-578.8999	(269)
Total CO2, kg/year			1817.4487	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.1100	(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	8068.3317	1.1300	9117.2148	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3071.2167	1.1300	3470.4748	(278)
Space and water heating			12587.6896	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	312.5745	1.5338	479.4372	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1485.4399	1.5005	-2228.9171	
PV Unit electricity exported	-2992.1976	0.4634	-1386.6538	
Total			-3615.5709	(283)
Total Primary energy kWh/year			9581.6567	(286)
Target Primary Energy Rate (TPER)			53.2800	(287)

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Plot Reference	5B10P				Issued on Date	08/04/2026	
Assessment Reference	BeGreen			Plot Type Ref			
Plot Address	Woodstock, Land West of Gatesmead, Haywards Heath, RH161SN				SAP Version	10.2	
SAP Rating	89 B	DER	2.06	TER	9.12		
Environmental	98 A	% DER < TER				77.41	
CO ₂ Emissions (t/year)	0.38	DFEE	37.29	TFEE	43.65		
Compliance Check	See BREL	% DFEE < TFEE				14.57	
% DPER < TPER	55.75	DPER	21.34	TPER	48.22		
Assessor Details	Mr. Mirza Baig				Assessor ID	CK52-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	107.3000 (1b)	x 2.7400 (2b)	= 294.0020 (1b) - (3b)
First floor	101.5000 (1c)	x 2.4600 (2c)	= 249.6900 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	208.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 543.6920 (5)

2. Ventilation rate

	m ³ 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)
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	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (22b)
Balanced mechanical ventilation with heat recovery												
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)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												71.2000 (23c)
Effective ac	0.3352	0.3315	0.3277	0.3090	0.3052	0.2865	0.2865	0.2827	0.2940	0.3052	0.3127	0.3202 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Front Door			2.1000	1.0000	2.1000		(26)
Window			36.9800	1.0536	38.9636		(27)
Heatloss Floor 1			107.3000	0.1000	10.7300	110.0000	11803.0000 (28a)
External Wall GF	224.2600	39.0800	185.1800	0.1600	29.6288	190.0000	35184.1990 (29a)
External Roof 1	101.5000		101.5000	0.1000	10.1500	9.0000	913.5000 (30)
Flat Roof	5.8000		5.8000	0.1000	0.5800	9.0000	52.2000 (30)
Total net area of external elements Aum(A, m ²)			438.8600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	92.1524		(33)
Main dwelling							
Internal Wall 1			374.7800			75.0000	28108.4999 (32c)
Internal Ceiling 1			101.5000			9.0000	913.5000 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 76974.8989 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							368.6537 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	44.0200	0.0560	2.4651
E6 Intermediate floor within a dwelling	32.5200	0.0050	0.1626
E10 Eaves (insulation at ceiling level)	42.2200	0.0500	2.1110
E12 Gable (insulation at ceiling level)	0.0000	0.0570	0.0000
E16 Corner (normal)	31.4500	0.0360	1.1322
E17 Corner (inverted - internal area greater than external area)	10.6700	-0.0900	-0.9603
E2 Other lintels (including other steel lintels)	25.6400	0.0620	1.5897
E3 Sill	16.6000	0.0390	0.6474
E4 Jamb	56.0000	0.0520	2.9120
E24 Eaves (insulation at ceiling level - inverted)	10.8200	0.0750	0.8115
E14 Flat roof	6.1900	0.0700	0.4333
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.3045 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	103.4569 (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	60.1500	59.4772	58.8044	55.4403	54.7675	51.4034	51.4034	50.7305	52.7490	54.7675	56.1131	57.4587	(38)
Heat transfer coeff	163.2656	162.9341	162.2613	158.8972	158.2244	154.8603	154.8603	154.1874	156.2059	158.2244	159.5700	160.9156	(39)
Average = Sum(39)m / 12 =												158.7290	
HLP	0.7836	0.7803	0.7771	0.7610	0.7578	0.7417	0.7417	0.7384	0.7481	0.7578	0.7642	0.7707	(40)
HLP (average)												0.7602	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.0134 (42)
Hot water usage for mixer showers	74.7441	73.6209	71.9841	68.8523	66.5412	63.9638	62.4988	64.1233	65.9039	68.6712	71.8702	74.4577	(42a)
Hot water usage for baths	32.2656	31.7864	31.1116	29.8674	28.9358	27.9027	27.3447	28.0148	28.7444	29.8498	31.1196	32.1566	(42b)
Hot water usage for other uses	45.4899	43.8357	42.1815	40.5274	38.8732	37.2190	37.2190	38.8732	40.5274	42.1815	43.8357	45.4899	(42c)
Average daily hot water use (litres/day)												140.1814	(43)
Daily hot water use	152.4997	149.2430	145.2772	139.2471	134.3501	129.0855	127.0626	131.0112	135.1757	140.7026	146.8256	152.1042	(44)
Energy conte	241.5222	212.5201	223.2857	190.6223	180.8611	158.7257	153.6712	162.2193	166.6851	190.9321	209.1800	238.1584	(45)
Energy content (annual)										Total = Sum(45)m =		2328.3832	
Distribution loss (46)m = 0.15 x (45)m	36.2283	31.8780	33.4929	28.5934	27.1292	23.8089	23.0507	24.3329	25.0028	28.6398	31.3770	35.7238	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8100	(55)
Total storage loss	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	(56)
If cylinder contains dedicated solar storage													
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	(57)
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	289.8946	256.2113	271.6581	237.4343	229.2335	205.5377	202.0436	210.5917	213.4971	239.3045	255.9920	286.5308	(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	289.8946	256.2113	271.6581	237.4343	229.2335	205.5377	202.0436	210.5917	213.4971	239.3045	255.9920	286.5308	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2897.9292	(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	119.0040	105.6159	112.9404	100.8315	98.8342	90.2259	89.7936	92.6358	92.8724	102.1828	107.0019	117.8856	(65)

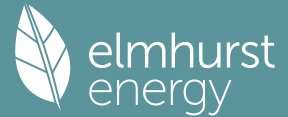
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	150.6683	150.6683	150.6683	150.6683	150.6683	150.6683	150.6683	150.6683	150.6683	150.6683	150.6683	150.6683	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	191.3303	211.8300	191.3303	197.7080	191.3303	197.7080	191.3303	191.3303	197.7080	191.3303	197.7080	191.3303	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	379.3338	383.2701	373.3508	352.2337	325.5771	300.5237	283.7865	279.8502	289.7695	310.8866	337.5432	362.5966	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.0668	38.0668	38.0668	38.0668	38.0668	38.0668	38.0668	38.0668	38.0668	38.0668	38.0668	38.0668	(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)	-120.5347	-120.5347	-120.5347	-120.5347	-120.5347	-120.5347	-120.5347	-120.5347	-120.5347	-120.5347	-120.5347	-120.5347	(71)
Water heating gains (Table 5)	159.9517	157.1665	151.8016	140.0438	132.8417	125.3138	120.6903	124.5105	128.9895	137.3425	148.6138	158.4484	(72)
Total internal gains	798.8163	820.4671	784.6832	758.1860	717.9497	691.7460	664.0076	663.8916	684.6675	707.7600	752.0655	780.5758	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	2.9400	11.2829	0.4000	1.0000	0.7700	9.1952 (75)
Southwest	18.0900	36.7938	0.4000	1.0000	0.7700	184.5044 (79)

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Northwest				15.9500		11.2829		0.4000		1.0000		0.7700		49.8857 (81)	

Solar gains	243.5854	434.5403	646.6827	888.6418	1075.1007	1102.4046	1048.2376	903.7681	729.6289	494.3141	295.3329	206.1458	(83)		
Total gains	1042.4017	1255.0075	1431.3660	1646.8278	1793.0504	1794.1506	1712.2452	1567.6596	1414.2964	1202.0741	1047.3984	986.7217	(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	130.6908	131.2305	131.7746	134.5645	135.1367	138.0723	138.0723	138.6748	136.8829	135.1367	133.9971	132.8766	
alpha	9.7127	9.7487	9.7850	9.9710	10.0091	10.2048	10.2048	10.2450	10.1255	10.0091	9.9331	9.8584	
util living area	0.9999	0.9996	0.9970	0.9625	0.7977	0.5518	0.3979	0.4524	0.7499	0.9880	0.9997	1.0000 (86)	
Living	20.4706	20.5651	20.6955	20.8691	20.9567	20.9691	20.9694	20.9695	20.9641	20.8336	20.6231	20.4623	
Non living	19.7735	19.8704	20.0027	20.1815	20.2526	20.2735	20.2736	20.2765	20.2658	20.1539	19.9412	19.7753	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.7292	20.5651	20.6955	20.8691	20.9567	20.9691	20.9694	20.9695	20.9641	20.8336	20.6231	20.5375 (87)	
Th 2	20.2676	20.2704	20.2732	20.2873	20.2901	20.3042	20.3042	20.3070	20.2985	20.2901	20.2844	20.2788 (88)	
util rest of house	0.9999	0.9994	0.9954	0.9454	0.7460	0.4922	0.3350	0.3843	0.6799	0.9797	0.9995	1.0000 (89)	
MIT 2	20.0148	19.8704	20.0027	20.1815	20.2526	20.2735	20.2736	20.2765	20.2658	20.1539	19.9412	19.8457 (90)	
Living area fraction													
MIT	20.1433	19.9953	20.1273	20.3051	20.3792	20.3986	20.3987	20.4012	20.3913	20.2762	20.0638	19.9702 (92)	
Temperature adjustment												0.0000	
adjusted MIT	20.1433	19.9953	20.1273	20.3051	20.3792	20.3986	20.3987	20.4012	20.3913	20.2762	20.0638	19.9702 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9999	0.9993	0.9950	0.9459	0.7528	0.5003	0.3436	0.3935	0.6895	0.9795	0.9994	0.9999 (94)	
Useful gains	1042.3121	1254.1359	1424.1384	1557.7931	1349.7393	897.5907	588.2675	616.9041	975.0939	1177.4107	1046.7989	986.6672 (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	2592.0721	2459.5417	2211.1853	1812.2422	1373.2577	897.9748	588.2746	616.9306	982.7450	1531.0028	2068.6358	2537.6640 (97)	
Space heating kWh	1153.0214	810.0327	585.5629	183.2033	17.4977	0.0000	0.0000	0.0000	0.0000	263.0726	735.7226	1153.9416 (98a)	
Space heating requirement - total per year (kWh/year)												4902.0548	
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	1153.0214	810.0327	585.5629	183.2033	17.4977	0.0000	0.0000	0.0000	0.0000	263.0726	735.7226	1153.9416 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												4902.0548	
Space heating per m2										(98c) / (4) =		23.4773 (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 %)													431.3580 (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	1153.0214	810.0327	585.5629	183.2033	17.4977	0.0000	0.0000	0.0000	0.0000	263.0726	735.7226	1153.9416 (98)	
Space heating efficiency (main heating system 1)	431.3580	431.3580	431.3580	431.3580	431.3580	0.0000	0.0000	0.0000	0.0000	431.3580	431.3580	431.3580 (210)	
Space heating fuel (main heating system)	267.3003	187.7866	135.7487	42.4713	4.0564	0.0000	0.0000	0.0000	0.0000	60.9871	170.5596	267.5136 (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	289.8946	256.2113	271.6581	237.4343	229.2335	205.5377	202.0436	210.5917	213.4971	239.3045	255.9920	286.5308 (64)	
Efficiency of water heater (217)m	190.6833	190.6833	190.6833	190.6833	190.6833	190.6833	190.6833	190.6833	190.6833	190.6833	190.6833	190.6833 (216)	
Fuel for water heating, kWh/month	152.0293	134.3648	142.4656	124.5176	120.2169	107.7901	105.9577	110.4405	111.9642	125.4984	134.2498	150.2653 (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	58.3635	52.7154	58.3635	56.4808	58.3635	56.4808	58.3635	58.3635	56.4808	58.3635	56.4808	58.3635 (231)	
Lighting	46.7564	37.5097	33.7733	24.7438	19.1128	15.6153	17.4353	22.6631	29.4371	38.6231	43.6247	48.0559 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-32.7352	-50.2103	-78.0009	-93.3302	-105.8459	-101.1545	-99.9104	-91.1532	-76.4924	-59.3397	-37.2031	-27.8278 (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												1136.4237 (211)	
Space heating fuel - main system 2												0.0000 (213)	

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Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	190.6833
Water heating fuel used	1519.7602 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.0360)	
mechanical ventilation fans (SFP = 1.0360)	687.1832 (230a)
Total electricity for the above, kWh/year	687.1832 (231)
Electricity for lighting (calculated in Appendix L)	377.3506 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-853.2035 (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	2867.5142 (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	1136.4237	0.1572	178.6477 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1519.7602	0.1410	214.3089 (264)
Space and water heating			392.9565 (265)
Pumps, fans and electric keep-hot	687.1832	0.1387	95.3208 (267)
Energy for lighting	377.3506	0.1443	54.4634 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-853.2035	0.1332	-113.6151
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-113.6151 (269)
Total CO2, kg/year			429.1256 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.0600 (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	1136.4237	1.5820	1797.7744 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1519.7602	1.5214	2312.2054 (278)
Space and water heating			4109.9798 (279)
Pumps, fans and electric keep-hot	687.1832	1.5128	1039.5708 (281)
Energy for lighting	377.3506	1.5338	578.7929 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-853.2035	1.4921	-1273.0395
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-1273.0395 (283)
Total Primary energy kWh/year			4455.3040 (286)
Dwelling Primary energy Rate (DPER)			21.3400 (287)

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

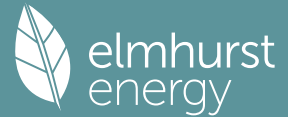
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	107.3000 (1b)	x 2.7400 (2b)	= 294.0020 (1b) - (3b)
First floor	101.5000 (1c)	x 2.4600 (2c)	= 249.6900 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	208.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n) =	543.6920 (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	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.0736 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3236 (18)
Number of sides sheltered	0 (19)

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Shelter factor
Infiltration rate adjusted to include shelter factor

$$(20) = 1 - [0.075 \times (19)] = 1.0000 \quad (20)$$
$$(21) = (18) \times (20) = 0.3236 \quad (21)$$

	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 infiltr rate	0.4126	0.4045	0.3964	0.3559	0.3478	0.3074	0.3074	0.2993	0.3236	0.3478	0.3640	0.3802	(22b)
Effective ac	0.5851	0.5818	0.5786	0.5633	0.5605	0.5472	0.5472	0.5448	0.5523	0.5605	0.5663	0.5723	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type			36.9800	1.1450	42.3435			(27)
Heatloss Floor 1			107.3000	0.1300	13.9490			(28a)
External Wall GF	224.2600	39.0800	185.1800	0.1800	33.3324			(29a)
External Roof 1	101.5000		101.5000	0.1100	11.1650			(30)
Flat Roof	5.8000		5.8000	0.1100	0.6380			(30)
Total net area of external elements Aum(A, m2)			438.8600					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	103.5279		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K

368.6537 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E5 Ground floor (normal)	44.0200	0.1600	7.0432	
E6 Intermediate floor within a dwelling	32.5200	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)	42.2200	0.0600	2.5332	
E12 Gable (insulation at ceiling level)	0.0000	0.0600	0.0000	
E16 Corner (normal)	31.4500	0.0900	2.8305	
E17 Corner (inverted - internal area greater than external area)	10.6700	-0.0900	-0.9603	
E2 Other lintels (including other steel lintels)	25.6400	0.0500	1.2820	
E3 Sill	16.6000	0.0500	0.8300	
E4 Jamb	56.0000	0.0500	2.8000	
E24 Eaves (insulation at ceiling level - inverted)	10.8200	0.2400	2.5968	
E14 Flat roof	6.1900	0.0800	0.4952	

Thermal bridges (Sum(L x Psi) calculated using Appendix K)

19.4506 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 122.9785 (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	104.9777	104.3848	103.8036	101.0740	100.5633	98.1858	98.1858	97.7455	99.1016	100.5633	101.5964	102.6766	(38)
Heat transfer coeff	227.9562	227.3633	226.7822	224.0525	223.5418	221.1643	221.1643	220.7241	222.0801	223.5418	224.5749	225.6551	(39)
Average = Sum(39)m / 12 =													224.0500

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0917	1.0889	1.0861	1.0730	1.0706	1.0592	1.0592	1.0571	1.0636	1.0706	1.0756	1.0807	(40)
HLP (average)												1.0730	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.0134 (42)
Hot water usage for mixer showers	74.7441	73.6209	71.9841	68.8523	66.5412	63.9638	62.4988	64.1233	65.9039	68.6712	71.8702	74.4577	(42a)
Hot water usage for baths	32.2656	31.7864	31.1116	29.8674	28.9358	27.9027	27.3447	28.0148	28.7444	29.8498	31.1196	32.1566	(42b)
Hot water usage for other uses	45.4899	43.8357	42.1815	40.5274	38.8732	37.2190	37.2190	38.8732	40.5274	42.1815	43.8357	45.4899	(42c)
Average daily hot water use (litres/day)													140.1814 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	152.4997	149.2430	145.2772	139.2471	134.3501	129.0855	127.0626	131.0112	135.1757	140.7026	146.8256	152.1042	(44)
Energy conte	241.5222	212.5201	223.2857	190.6223	180.8611	158.7257	153.6712	162.2193	166.6851	190.9321	209.1800	238.1584	(45)
Energy content (annual)										Total = Sum(45)m =		2328.3832	

Distribution loss (46)m = 0.15 x (45)m	36.2283	31.8780	33.4929	28.5934	27.1292	23.8089	23.0507	24.3329	25.0028	28.6398	31.3770	35.7238	(46)
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Water storage loss (or HIU loss):

Store volume													200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6525 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8924 (55)

Total storage loss	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(56)
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If cylinder contains dedicated solar storage	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(57)
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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	292.4482	258.5178	274.2118	239.9056	231.7872	208.0090	204.5972	213.1454	215.9684	241.8581	258.4633	289.0845	(62)
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WWHRS	-34.1699	-30.2201	-31.6448	-26.2031	-24.4204	-20.8967	-19.5873	-20.8291	-21.6205	-25.4882	-28.8750	-33.5371	(63a)
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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)
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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)

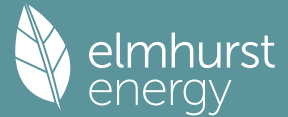
Output from w/h	258.2784	228.2977	242.5670	213.7025	207.3668	187.1123	185.0099	192.3162	194.3479	216.3699	229.5882	255.5474	(64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2610.5043	(64)

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	121.0470	107.4611	114.9834	102.8086	100.8772	92.2029	91.8365	94.6788	94.8494	104.2258	108.9790	119.9285	(65)
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5. Internal gains (see Table 5 and 5a)

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Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	150.6683	150.6683	150.6683	150.6683	150.6683	150.6683	150.6683	150.6683	150.6683	150.6683	150.6683	150.6683 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	195.9330	216.9258	195.9330	202.4641	195.9330	202.4641	195.9330	195.9330	202.4641	195.9330	202.4641	195.9330 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	379.3338	383.2701	373.3508	352.2337	325.5771	300.5237	283.7865	279.8502	289.7695	310.8866	337.5432	362.5966 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.0668	38.0668	38.0668	38.0668	38.0668	38.0668	38.0668	38.0668	38.0668	38.0668	38.0668	38.0668 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-120.5347	-120.5347	-120.5347	-120.5347	-120.5347	-120.5347	-120.5347	-120.5347	-120.5347	-120.5347	-120.5347	-120.5347 (71)
Water heating gains (Table 5)	162.6976	159.9124	154.5475	142.7897	135.5876	128.0596	123.4362	127.2564	131.7353	140.0884	151.3597	161.1943 (72)
Total internal gains	809.1649	831.3088	795.0318	768.6879	728.2982	699.2479	671.3562	671.2401	692.1695	718.1085	762.5675	790.9244 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Northeast				2.9400	11.2829		0.6300		0.7000		0.7700		10.1377 (75)
Southwest				18.0900	36.7938		0.6300		0.7000		0.7700		203.4161 (79)
Northwest				15.9500	11.2829		0.6300		0.7000		0.7700		54.9990 (81)
Solar gains	268.5529	479.0807	712.9677	979.7276	1185.2986	1215.4010	1155.6820	996.4043	804.4159	544.9813	325.6046	227.2758	(83)
Total gains	1077.7178	1310.3895	1507.9995	1748.4156	1913.5968	1914.6490	1827.0381	1667.6444	1496.5853	1263.0898	1088.1720	1018.2001	(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	93.7984	94.0430	94.2839	95.4326	95.6507	96.6789	96.6789	96.8717	96.2802	95.6507	95.2106	94.7549
alpha	7.2532	7.2695	7.2856	7.3622	7.3767	7.4453	7.4453	7.4581	7.4187	7.3767	7.3474	7.3170
util living area	0.9999	0.9996	0.9981	0.9856	0.9138	0.7172	0.5303	0.6029	0.8914	0.9949	0.9997	1.0000 (86)
MIT	19.9732	20.1153	20.3286	20.6274	20.8754	20.9840	20.9984	20.9962	20.9251	20.5970	20.2332	19.9552 (87)
Th 2	20.0076	20.0099	20.0122	20.0229	20.0249	20.0343	20.0343	20.0360	20.0307	20.0249	20.0209	20.0166 (88)
util rest of house	0.9999	0.9994	0.9971	0.9768	0.8680	0.6203	0.4154	0.4802	0.8180	0.9907	0.9995	0.9999 (89)
MIT 2	18.7992	18.9833	19.2582	19.6434	19.9281	20.0274	20.0340	20.0352	19.9856	19.6107	19.1432	18.7833 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.0103	19.1868	19.4507	19.8203	20.0984	20.1994	20.2074	20.2080	20.1546	19.7881	19.3392	18.9940 (92)
Temperature adjustment												
adjusted MIT	19.0103	19.1868	19.4507	19.8203	20.0984	20.1994	20.2074	20.2080	20.1546	19.7881	19.3392	18.9940 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9998	0.9992	0.9962	0.9744	0.8720	0.6377	0.4362	0.5025	0.8291	0.9892	0.9993	0.9999 (94)
Useful gains	1077.5234	1309.3247	1502.2704	1703.6825	1668.7425	1220.8887	796.8885	837.9906	1240.7462	1249.3871	1087.4454	1018.0809 (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	3353.3078	3248.3022	2936.9804	2446.7305	1877.4033	1238.3914	797.8303	840.5148	1344.6037	2053.9199	2748.6216	3338.3471 (97)
Space heating kWh	1693.1836	1302.9928	1067.4242	534.9945	155.2436	0.0000	0.0000	0.0000	0.0000	598.5725	1196.0469	1726.2781 (98a)
Space heating requirement - total per year (kWh/year)	8274.7362											
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	1693.1836	1302.9928	1067.4242	534.9945	155.2436	0.0000	0.0000	0.0000	0.0000	598.5725	1196.0469	1726.2781 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	8274.7362											
Space heating per m ²	(98c) / (4) = 39.6300 (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	1693.1836	1302.9928	1067.4242	534.9945	155.2436	0.0000	0.0000	0.0000	0.0000	598.5725	1196.0469	1726.2781 (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)	1834.4351	1411.6932	1156.4726	579.6257	168.1946	0.0000	0.0000	0.0000	0.0000	648.5075	1295.8254	1870.2905 (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 requirement	258.2784	228.2977	242.5670	213.7025	207.3668	187.1123	185.0099	192.3162	194.3479	216.3699	229.5882	255.5474 (64)
Efficiency of water heater	87.4940	87.3316	86.9835	86.0305	83.4197	79.8000	79.8000	79.8000	79.8000	86.2183	87.2159	79.8000 (216)
(217)m	87.5271 (217)											

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Fuel for water heating, kWh/month	295.1955	261.4149	278.8656	248.4031	248.5826	234.4766	231.8420	240.9978	243.5438	250.9560	263.2412	291.9637	(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	40.7110	32.6599	29.4066	21.5445	16.6416	13.5963	15.1810	19.7329	25.6311	33.6294	37.9843	41.8425	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-88.3593	-118.8969	-163.1257	-174.6601	-181.0835	-166.2411	-163.8924	-157.9972	-146.9291	-131.3642	-94.9701	-77.0480	(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	-68.7490	-141.9542	-277.4900	-410.3427	-536.6832	-537.3606	-531.2923	-452.7309	-335.5544	-201.1238	-91.1264	-54.5962	(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												8965.0446	(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												3089.4826	(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)												328.5611	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-5303.5715	(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												7165.5169	(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	8965.0446	0.2100	1882.6594	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3089.4826	0.2100	648.7913	(264)
Space and water heating			2531.4507	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	328.5611	0.1443	47.4215	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1664.5677	0.1356	-225.7906	
PV Unit electricity exported	-3639.0038	0.1263	-459.7864	
Total			-685.5770	(269)
Total CO2, kg/year			1905.2245	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.1200	(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	8965.0446	1.1300	10130.5005	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3089.4826	1.1300	3491.1153	(278)
Space and water heating			13621.6158	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	328.5611	1.5338	503.9580	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1664.5677	1.5014	-2499.1489	
PV Unit electricity exported	-3639.0038	0.4638	-1687.8028	
Total			-4186.9517	(283)
Total Primary energy kWh/year			10068.7230	(286)
Target Primary Energy Rate (TPER)			48.2200	(287)

APPENDIX D

Summary of LZO Technologies Not Feasible for the Development

Low and Zero-Carbon Technologies Not Feasible for the Site

Solar Thermal Panels

Solar hot water systems (SHW) use the energy radiated by the sun and convert it into useful heat in the form of hot water.

Heat is transferred and stored in a central thermal store. The solar panel system would ideally supply approximately 45-55% of the development's hot water requirement; the remainder of the energy required for hot water would be supplied by the gas boilers.

Solar thermal panels are ideal for buildings with a highly insulated building envelope as the energy demand for heating water is relatively high in comparison to space heating demand.

Solar thermal panels are most efficient when evacuated tube technology is used. This leads to a bulky and visually less pleasing system that will be aesthetically more intrusive.

The proposed building features a pitched roof, necessitating that the solar collectors be mounted accordingly. The angle of the collectors is fixed based on the roof pitch, which may not always provide the optimal angle for solar gain. To maximise hot water output, the collectors should ideally face south, south-west, or south-east. This orientation ensures that the collectors receive the most sunlight throughout the day, enhancing their efficiency in generating hot water.

Solar thermal panels could be specified to complement the proposed ASHP strategy but would require a large hot water storage tank located in the cupboard with long circulation pipes providing hot water to the kitchen. This would lead to additional losses from the system.

A SHW system alone would not achieve the required 35% reduction in CO₂ emissions mandated by the Mid Sussex District Council Local Plan. Consequently, it will be necessary to incorporate additional technologies into the building design. This integration may compromise available space and lead to an increase in overall construction costs.

For these reasons, a solar hot water system is not recommended for the site.

Gas CHP (Combined Heat and Power)

A conventionally fuelled CHP system would utilise a prime mover such as a diesel engine or gas turbine to drive an electrical generator. The heat generated by the prime mover during this process would be utilised in a community heating network.

Gas CHP systems are energy efficient and considered as low-carbon technologies. For CHP to be viable, it must run almost continuously and thus requires a permanent heat demand (hence its suitability for swimming pools, hospitals, etc).

The proposed development would not fully utilise the energy generated by the CHP engine and therefore would result in inefficient running of the system.

Air quality issues resulting from the operation of a gas CHP system would also have to be addressed, and an increase in associated NOx emissions would have to be mitigated.

It is therefore not recommended that gas fired-CHP be considered for this site.

Bio-fuels

Bio-fuels have the potential to contribute to the reduction of CO₂ emissions of various developments by using this fuel within a boiler or CHP plant. Biofuels are considered to have low or zero CO₂ intensities as theoretically the CO₂ released when these fuels are combusted is no greater than the CO₂ that has been absorbed from the atmosphere when the plants grew.

However, there are a number of issues which must be considered with this type of fuel in urban locations:

Potential air quality impacts with combusting bio-fuels in urban areas, in particular elevated NOx emissions and particulates and must be addressed.

Transporting this type of fuel increases lorry movements into and out of London, affecting congestion and transport emissions. The relatively rapid degradation of biodiesel would require appropriately sized on-site storage tanks with regular fuel deliveries.

Importantly, the actual bio-diesel CO₂ intensity cannot be guaranteed due to variations in fuel stock supply, demand, the energy input for processing the fuel and CO₂ emissions due to growing, harvesting and processing the base fuel.

Biofuel availability is currently uncertain due to unknown future supply and demand. Whilst an increase in demand for larger developments may stimulate the supply chain, availability could change with variation in demand. Transport is likely to have the most significant impact on the biofuel industry over emerging building demand.

Socio-economic issues from growing and harvesting feedstock, with potential impacts on food production, particularly for biodiesel that is imported. Solid biofuels have a lesser impact in this area.

On-site fuel storage requirements require additional space, along with regular access to the on-site fuel storage area.

Increased plant maintenance is generally required, adding to costs and plant downtime.

Consequently, biofuels for combustion within a boiler are not appropriate for the scheme.

Wind Turbines

Although a wind turbine could be sized to meet the requirements of this development, there are numerous factors that would discount its suitability in this setting. Typically, wind turbines perform poorly in urban environments as surrounding buildings and features dissipate much of the useful energy of the wind before it can be extracted by the turbine. The tower would also require a large amount of free space for the erecting and periodic maintenance of the turbine. This is likely to be an issue with this site.

Environmental concerns such as noise and shadow flicker are also problematic in populated areas. While modern turbines have low levels of noise generation, even at high rotational speeds, the noise generated may still be an issue for local residents, particularly given the close proximity of the turbine. Given the dense urban setting of this development, shadow flicker is likely to be a problem for the residents of the proposed development. A wind turbine would not be a viable option for this development.

APPENDIX E

Space Heating Demand and EUI

Building Type	Area (m²)	No. of Units	Total Area (m²)	Space Heating (kWh/year) (SAP Worksheet 211)	Annual Energy Consumption (kWh/year) (SAP Worksheets 238+233)	Total Space Heating (kWh/year)	Total Energy Use (kWh/year)	Energy generated/saved by PV (kWh/year)	Total Energy generated/saved by PV (kWh/year)	% Energy saved by PV
1 Bedroom maisonette	50.6	4	202.4	190.7233	1654.487	762.8932	6617.948	-415.8699	-1663.4796	25%
2 Bedroom maisonette	70.3	2	140.6	295.5165	1923.2727	591.033	3846.5454	-436.7512	-873.5024	23%
2B4P House	79.68	5	398.4	325.1297	2008.5827	1625.6485	10042.9135	-739.3813	-3696.9065	37%
3B5P House	83.22	7	582.54	403.0273	2168.6185	2821.1911	15180.3295	-749.4046	-5245.8322	35%
3B6P House	126.33	8	1010.64	606.1543	2705.452	4849.2344	21643.616	-799.3652	-6394.9216	30%
4B6P House	106.36	0	0	412.7801	2375.8579	0	0	-779.1202	0	0%
4B8P House	126.33	11	1389.63	783.2918	2965.702	8616.2098	32622.722	-812.3701	-8936.0711	27%
5B9P House	179.85	8	1438.8	1036.5207	3481.1406	8292.1656	27849.1248	-839.6797	-6717.4376	24%
5B10P House	208.8	4	835.2	1136.4237	3720.7177	4545.6948	14882.8708	-853.2035	-3412.814	23%
Total	—	—	5,998.21	—	—	32,104.07	132,686.07	-6425.1457	-36940.965	

Space Heating Demand (kWh/m²)	5.35
Energy Use Intensity – EUI (kWh/m²)	22.12

Crest Nicholson Operations Limited

LAND WEST OF GATESMEAD

Energy and Sustainability Statement

The information contained within this report and any appendices or supporting information provided are to be treated as confidential.



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