



Energy Strategy

**LADDS GARDEN CENTRE, BATH ROAD,
RG10 9SB**

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Prepared By	Naomi Sadler BSc(Hons) Dip MIEnvSc	Surveyor ID: 4611-0001
Checked By	Jayne Dakin	

About Sadler Energy and Environmental Services Ltd.

Our team of technical specialists offer advanced levels of expertise and experience to our clients. We have a wide experience of the construction and development industry from the concept and planning stage through to the completion of the project.

Our emphasis is to provide innovative and cost-effective solutions that respond to increasing demands for energy efficiency, quality and practical on-site applications.

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Executive Summary

This Energy Strategy has been prepared for the proposed development at Ladds Garden Centre, Hare Hatch, comprising 19 dwellings (houses and apartments) with associated landscaping, car parking, and infrastructure works.

The purpose of this report is to demonstrate compliance with Wokingham Borough Council's Local Plan (Policy CP1: Sustainable Development, January 2010), which requires all new developments to incorporate sustainable construction and achieve a minimum 10% reduction in carbon emissions through renewable energy technologies. The strategy also responds to the Council's declared Climate Emergency by delivering energy-efficient, low-carbon homes that significantly exceed baseline policy requirements.

The approach taken is fabric-first, prioritising reductions in energy demand through improved building fabric, airtightness, and low-energy services before integrating renewable and low-carbon technologies. Three options have been modelled using SAP 2021 to demonstrate compliance:

1. Option 1 – Air Source Heat Pumps (ASHPs) to all dwellings, delivering carbon reductions of over 50% compared with Part L 2021.
2. Option 2 – Heat pump hot water cylinders for the apartments, combined with ASHPs for the houses and solar 2kWp of PV, achieving over 57% carbon reductions and 26% site-wide energy savings.
3. Option 3 – 8 kWp of Photovoltaic (PV) panels with Sunamp thermal batteries for the apartments and ASHPs for the houses, delivering over 57% carbon reductions and up to 26% primary energy savings.

All three options comfortably surpass the 10% renewable energy requirement and demonstrate compliance with Wokingham Borough Council's planning policy CP1, while future-proofing the dwellings for stricter upcoming carbon reduction standards.

1. Information and Background

This Energy Strategy outlines the measures and technologies required to ensure that the 19 new homes (a mix of houses and apartments) at Ladds Garden Centre meet and exceed both Building Regulations (Part L 2021) and the sustainability objectives of Wokingham Borough Council.

The Council's planning policy CP1 requires:

-  At least a 10% reduction in carbon emissions through the use of on-site renewable energy technologies.
-  Incorporation of sustainable design and construction practices to minimise reliance on fossil fuels.
-  Delivery of energy-efficient homes that contribute to the borough's wider commitments under the Climate Emergency Declaration.

Energy and CO₂ performance has been assessed using SAP 2021, ensuring both Building Regulation compliance and consistency with Wokingham's planning requirements. The strategy applies the recognised energy hierarchy:

1. Use less energy – fabric-first measures, improved insulation, air tightness, and passive design.
2. Supply energy efficiently – use of low-carbon heating and hot water systems (ASHPs, heat pump cylinders).
3. Use renewable energy – integration of PV panels and thermal batteries where feasible.

By applying this hierarchy, the scheme achieves carbon reductions well above the minimum 10% planning requirement. In practice, all options modelled deliver over 50% reductions, ensuring the homes are compliant, sustainable, and resilient to future changes in energy standards.



Image 1 – Site Plan

2. Planning Targets

The Wokingham Borough Local Plan was adopted in January 2010 and sets measures to respond to the declared climate emergency. Policy CP1 details what measures developments should incorporate for Sustainable Development:

CP1 – Sustainable Development

Planning permission will be granted for development proposals that:

1. *Maintain or enhance the high quality of the environment.*
2. *Minimise the emission of pollutants into the wider environment.*
3. *Limit any adverse effects on water quality (including ground water);*
4. *Ensure the provision of adequate drainage;*
5. *Minimise the consumption and use of resources and provide for recycling;*
6. *Incorporate facilities for recycling of water and waste to help reduce per capita water consumption;*
7. *Avoid areas of best and most versatile agricultural land;*
8. *Avoid areas where pollution (including noise) may impact upon the amenity of future occupiers;*
9. *Avoid increasing (and where possible reduce) risks of or from all forms of flooding (including from groundwater);*
10. *Provide attractive, functional, accessible, safe, secure and adaptable schemes;*
11. *Demonstrate how they support opportunities for reducing the need to travel, particularly by private car in line with CP6;*
and
12. *Contribute towards the goal of reaching zero-carbon developments as soon as possible by:*
 - a. *Including appropriate on-site renewable energy features; and*
 - b. *Minimising energy and water consumption by measures including the use of appropriate layout and orientation, building form, design and construction, and design to take account of microclimate so as to minimise carbon dioxide emissions through giving careful consideration to how all aspects of development form.*

Sustainable Design and Construction Supplementary Planning Document (Adopted 28 May 2010)

Policy NRM11 (Development design for energy efficiency and renewable energy) of the South East Plan requires residential development of more than 10 dwellings and non-residential development of 1000m² or greater (major development) to secure at least 10% of their energy from decentralized, renewable or low-carbon technologies.

Sustainability Statement should be submitted evidencing the relevant information in support of the planning application. The report should show how a development is designed to meet the interpretation of sustainable development as set out in the:

- *National planning guidance - in particular PPS1 Supplement.*
- *South East Plan;*
- *Wokingham Borough Core Strategy DPD;*
- *This SPD and companion document; and*
- *Other relevant policy documents.*

2.1 Policy Context

Wokingham Borough Council's Local Plan (Policy CP1: Sustainable Development, January 2010) requires:

- A minimum 10% reduction in carbon emissions from on-site renewable energy technologies.
- Sustainable construction methods to minimise reliance on fossil fuels.
- Delivery of energy-efficient homes that support the Council's Climate Emergency commitments.

In addition to Wokingham Borough Council's Local Plan Policy CP1, the development aligns with the wider regional and national frameworks for carbon reduction.

The South East Plan Policy NRM11 (Renewable Energy) requires new developments to contribute to renewable energy generation and carbon reduction targets by incorporating on-site low- and zero-carbon technologies. This strategy demonstrates compliance by modelling a range of suitable approaches, including air source heat pumps (ASHPs) for houses, photovoltaic (PV) panels, heat pump cylinders, or Sunamp thermal batteries, all underpinned by a fabric-first design approach that reduces baseline energy demand. Collectively, these options achieve well over 50% carbon reductions across the site, exceeding the policy requirements.

Furthermore, Wokingham Borough Council has formally declared a Climate Emergency, committing to ambitious carbon reduction targets across the borough. The UK Government has also set a legally binding target to achieve net zero carbon by 2050. By exceeding the minimum 10% renewable energy requirement of Policy CP1 and delivering significant site-wide carbon and energy savings, this development makes a measurable contribution to these wider commitments.

This strategy therefore not only complies with local planning policy (CP1) and regional renewable energy policy (NRM11) but also demonstrates alignment with the Council's Climate Emergency Declaration and the national trajectory towards net zero.

2.2 Proposed Energy Strategy

This Energy Strategy adopts a fabric-first approach, significantly improving building envelope performance, airtightness, and energy efficiency. Renewable and low-carbon technologies have been modelled using SAP 2021, with three options considered:

1. Air Source Heat Pumps (ASHPs) to all dwellings.
2. ASHPs with heat pump hot water cylinders to the apartments and solar PV.
3. ASHPs with photovoltaic (PV) panels and Sunamp thermal batteries to the apartments.

Performance Outcomes:

- All options achieve over 50% reduction in carbon emissions compared with Part L 2021 requirements.
- Site-wide primary energy savings of up to 26% are demonstrated.
- Each option significantly exceeds the 10% renewable requirement of Policy CP1.

3. Energy Efficiency

Energy efficiency and carbon emission rates have been calculated using SAP10, which produces metrics used for Building Regulations compliance, based on the predicted annual energy use per square meter of floor area for a dwelling. The metrics used in this report are:

- 🌱 Dwelling Emissions Rate (DER): the predicted carbon dioxide emissions based on the fuels used to heat, light, cool and ventilate a dwelling, expressed in kgCO₂/m²/yr.
- 🌱 Dwelling Fabric Energy Efficiency: the predicted energy used to heat and cool a dwelling expressed in kWh/m²/yr.

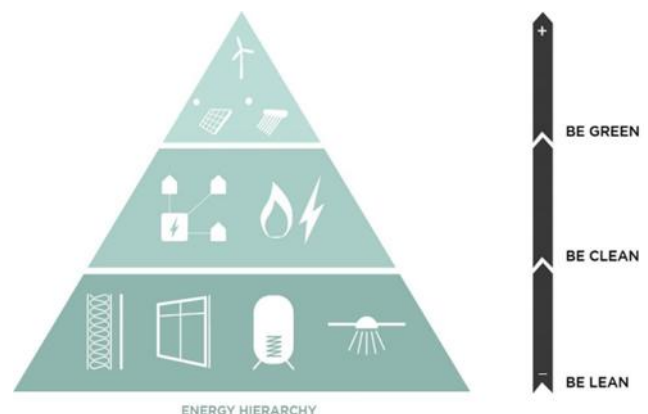
For each metric, a “target” is calculated by SAP based on a notional dwelling specification set in the Building Regulations. The dwelling energy metrics must be lower than these targets to achieve Building Regulation Part L compliance.

This energy strategy will outline carbon emission savings through fabric-first approaches and renewable technology options, with the aim to achieve low and zero carbon dwellings. Each option will be modelled in SAP and produce percentage savings on dwelling emission rates (DER) for properties vs target emission rates (TER), and percentage savings on dwelling fabric energy efficiency (DFEE) vs target dwelling fabric energy efficiency (TFEE).

3.1 Methodology

This report uses the energy hierarchy to minimise onsite carbon emissions, the stages are:

- 🌱 Use Renewable Energy – assess the feasibility of renewable energy systems.
- 🌱 Supply Energy Efficiently – Use low-carbon technology to significantly reduce energy consumption.
- 🌱 Use less Energy – the incorporation of low energy design and passive measures to promise the reduction of energy use.



Indicative calculations have also been carried out using the SAP 2021 carbon emissions for each fuel type. This is intended to demonstrate that the proposals remain consistent with the expectation of both current and future regulations.

3.2 Building Energy Modelling

The site was simulated using SAP2021 to adhere to the planning requirements of the Wokingham Borough Council. Additionally, SAP2021 was employed to ensure compliance with building regulations and facilitate calculations for carbon offset payments (refer to SAP summary). This modelling process aimed to forecast energy requirements and CO₂ emissions, aligning with the stipulations of the planning policy.

4. Energy Efficiency

In order to deliver the energy demand reduction required to meet and exceed Part L 2021 compliance, improvements to the fabric specification and heating systems of the dwellings forms the first stage of the energy hierarchy.

A fabric first approach has been adopted to minimise energy demand as much as practical. Energy efficiency features that were proposed include: Built form, Insulation standards, Glazing, Heating systems, Ventilation, Lighting, Controls, Heat recovery, Free cooling, and Equipment. In this chapter we have detailed the most effective energy efficient measures.

Three main sources of heat loss:

-  Thermal Envelope
-  Thermal Bridging
-  Uncontrolled Air Leakage

4.1 Thermal Envelope

Table 1 summarises the proposed performance of the thermal envelope. It is proposed that all areas significantly improve upon the minimum building fabric standards stated within BR Part L 2021.

Thermal Element	BR U-value(Part L 2021) W/m ² K	Proposed Target values W/m ² K	% Improvement Over Building Regulations 2021
Ground Floor	0.18	0.11-0.12	38.89%
External wall	0.26	0.19	26.92%
Flat Roof	0.16	0.15	6.25%
Warm Roof	0.16	0.09	43.75%
External Doors	1.6	1.2	25%
Windows & Glazed Doors	1.6	1.2	25%

Table 1 - Proposed Fabric Standard

These proposed U-values show more an improvement on BR 2021 standards and are conducive to energy efficiency within built form and insulation standards.

4.2 Thermal Bridging

Thermal bridging occurs at the junction between fabric elements, where the continuous insulation line is broken. Through careful detailing of junctions, it is possible to mitigate against the impact of thermal bridges.

Westbourne Homes standard details ensure that the design of junctions minimises unnecessary bridging of the insulation layers, with avoidable heat loss being reduced wherever possible. Accurate calculation of these heat losses forms an integral part of the SAP calculations undertaken to establish energy consumption of the dwellings, and as such thermal modelling has been undertaken to assess the performance of all main building junctions. An

overall average Y-value of approximately 0.070 is achieved for the sample of units modelled, compared with a SAP default value of 0.150.

The dwellings on this development aim for minimal thermal bridging, with thermal bridging for all blocks well below BR 2021, see Table 2.

Junction With	Bridge Type		DEFAULT Ψ [w/mk]	LADDS GARDEN CTR Ψ [w/mk]
External Wall	E2	Lintels	1.0	0.029
External Wall	E3	Sill	0.1	0.046
External Wall	E4	Jamb	0.1	0.051
External Wall	E5	Ground floor (normal) Suspended Beam and block	0.32	0.056
External Wall	E6	Intermediate floor within a dwelling (timber)	0.14	0.00
External Wall	E7	Party floor between dwellings (Medium Block)	0.28	0.053
External Wall	E20	Exposed Floor (normal)	0.32	0.15
External Wall	E10	Eaves (Insulation at ceiling level)	0.12	0.053
External Wall	E12	Gable (insulation at ceiling level)	0.25	0.037
External Wall	E13	Gable (insulation at rafter level)	0.25	0.080
External Wall	E14	Flat Roof (With Parapet)	0.30	0.043
External Wall	E16	Corner	0.18	0.041
External Wall	E17	Corner (inverted)	0	-0.066

Table 2 – Thermal Bridging at Ladds Garden Centre

4.3 Uncontrolled Air Leakage and Ventilation

As buildings become more insulated, uncontrolled air leakage represents an increasing proportion of dwelling heat loss. As such, it is critical to ensure that any unwanted leakage is minimised. Table 3 details ventilation at Ladds Garden Centre, including air tightness and air permeability for each block.

Under current Building Regulations (2021) a dwelling must have an infiltration rate of less than 8m³/hm²@50Pa. The air permeability targets for Ladds Garden Centre will vary for each building type and will be much lower than 8, as seen in Table 3.

Building	Houses
Air Permeability (m ³ /hm ² 50Pa)	4.0

Table 3 - Air permeability

4.4 Lighting

Low energy fittings are defined as fittings that can only be used with lamps having a luminous efficacy greater than 80 lumens per circuit watt. All buildings will have 100% low energy lights fitted internally.

Externally, property will have low energy light fitting or standards with light and motion sensors.

4.5 Primary Energy

Heat generation and distribution systems will be designed to give the occupants a high level of control over their use, encouraging and allowing energy-efficient behaviour.

The heating system will be designed, at a maximum flow temperature of 55°C or lower with full zone control to occupants. Two heating systems are modelled further within this report for consideration:

- ❧ **Option 1** - Air Source Heat Pumps. Time and temperature zoning controls will be included with fully insulated primary pipework being installed throughout.
- ❧ **Option 2** - Air Source Heat Pumps. Time and temperature zoning controls will be included with fully insulated primary pipework being installed throughout with PV to model the reduction in the carbon offset payment.

The heating systems are considered further under Section 5 of this report.

4.6 Passive Design Measures and Overheating Risk Mitigation

Practical dwellings have been designed with the principles of passive design, including consideration of building orientation and site placement to maximise the potential for solar gain to reduce energy consumption.

Materials with high thermal inertia – including traditional masonry construction – take a number of hours to warm up in the conditions normally associated with the interior of domestic properties. By slowly extracting heat from the air inside a dwelling, they offer a heat sink and reduce overheating risk. The heat absorbed is then emitted during the night, offering a small amount of passive heating. The overall effect serves to smooth out the heat profile within the dwelling thus reducing the need for instantaneous heating and cooling.

Further passive and active design measures to reduce energy demand and balance internal and external heat gains include:

- ❧ Specifying glazing with a solar transmittance value (g-value) that has been carefully considered to strike the balance between useful solar gain in the winter and unwanted solar gain in the summer, 0.50 G-Value has been specified on this development within the overheating Part O assessment.
- ❧ Minimising overshadowing from adjacent dwellings and vegetation.
- ❧ Specifying highly insulated hot water cylinders where required, with low heat loss values.
- ❧ Fully insulating all primary pipework.
- ❧ Installing energy efficient lighting, a minimum of 80 l/w is specified on this development.

Due to the measures described to reduce internal heat gain, natural ventilation provided through window openings and the opportunity for cross ventilation will allow sufficient air exchange rates to purge any heat build-up. Active cooling systems are therefore not proposed.

These measures will serve to ensure that the development builds in resilience to a potentially changing climate over the lifetime of the buildings and minimises the overheating risk that can be exacerbated by the drive to better insulated, more airtight homes if not considered within the design and construction process.

4.7 Water Usage

To minimise onsite usage of potable water it is proposed that all dwellings will aspire to achieve a minimum water efficiency standard of 105 litres/person/day. It is recommended that maximum water consumption criteria, as

stated in table 2.2 of approved document Part G be followed, summarised in Table 4. This would have achieved a Code for Sustainable Homes rating of Level 4 if the scheme were still active.

Water Fitting	Maximum Consumption
WC	4/2.6 litres dual flush
Shower	8 l/min
Bath	170 litres
Basin Taps	3 l/min
Sink Taps	6 l/min
Dishwasher	1.25 l/place setting
Washing Machine	8.17 l/kilogram dry load

Table 4: (Part G2 Table 2.2) Maximum fittings consumption optional requirement level

4.8 Electric Vehicle Charge Point

Building Regulation Part S requires that new residential developments with associated parking must include provisions for electric vehicle charge points. Specifically, for each dwelling within the development, the developer must ensure that a minimum number of parking spaces are equipped with EV charge points. The minimum requirement is determined by one of the following criteria, whichever is higher:

- The total number of associated parking spaces provided.
- The total number of dwellings that the parking area serves.

Each plot is a separate dwelling, and the development includes parking spaces allocated for these dwellings.

Electric Vehicle Charge Point Provision

In accordance with Building Regulation Part S, the developer will provide EV charge points based on the following criteria:

- **Number of Dwellings:** The development consists of 19 dwellings.
- **Number of Associated Parking Spaces:** The development will include parking spaces for each of the 19 dwellings.

Based on the regulatory requirements, a minimum of 19 EV charge points will be provided, ensuring that each parking space is equipped with a charge point per plot.

The 19-plot residential development will fully comply with Building Regulation Part S by providing an EV charge point for each associated parking space, resulting in a total of 19 EV charge points. This approach not only meets regulatory requirements but also supports the transition to sustainable transportation, benefiting both the residents and the broader community.

4.9 High-Speed Internet Provision for the Development

To ensure the development meets modern connectivity needs, high-speed internet infrastructure will be integrated into the project from the outset. This includes the installation of fibre-optic cables or equivalent technology, ensuring that each dwelling has access to reliable and fast internet service.

Providing high-speed internet is essential for enhancing the quality of life for residents, supporting remote work, and increasing the overall value of the properties. The infrastructure will be future proofed to accommodate

advancements in technology and increased demand, ensuring that the development remains competitive and meets the digital needs of its residents.

This approach aligns with current planning standards and contributes to the sustainability of the development.

4.9.1 3-Phase Electric Supply for the Development

The development will be equipped with a 3-phase electric supply to meet the growing energy demands of modern homes. A 3-phase system provides a more robust and efficient power supply, capable of handling higher loads and ensuring the stable operation of energy-intensive appliances such as electric vehicle chargers, heat pumps, and other electrical systems which are proposed on the development.

Incorporating a 3-phase supply enhances the development's infrastructure, offering greater flexibility for future technological upgrades and supporting sustainability initiatives. This provision ensures that the development can meet both current and future energy requirements, aligning with industry standards and improving the overall appeal of the properties.

5. Energy Efficiency Low and Zero Carbon (LZC) Energy Generation and Results

The energy hierarchy requires that the feasibility of on-site renewables technology be investigated. This section reviews each of the technologies that are to be considered on a new development, with the most feasible method being selected.

Technology	Checklist	Comments	Suitable Technology
Solar Photovoltaic 	Will the buildings have an east to west (through south) facing roof or flat roof?	The viability of PV installation will need to be reviewed for certain design options due to potential limitations in available roof space.	Suitable, photovoltaic (PV) panels have been prioritised, as they offer greater flexibility, higher energy yield potential, and a more significant impact on regulated energy use and carbon emissions.
	Are roofs free from overshadowing for most of the day from buildings or other structures?	Surrounding dwelling heights do not exceed the height of the proposed dwellings. Sufficient distance from the existing established trees which are to be retained.	
	Is the building in a conservation area?	No	
Solar thermal 	Will the buildings have a year-round demand for hot water?	Yes	Solar hot water has not been modelled for this development due to its limited contribution to overall energy and carbon reduction targets, as well as practical integration challenges with modern low-carbon heating systems such as heat pumps.
	Will the buildings have an open aspect south east to south west facing roof of at least 4m ² ?	To minimise heat loss in the pipes for a solar hot water system, it is recommended to keep the distance between the solar hot water collector and the hot water cylinder as short as possible. Ideally, this distance should be no more than <10m. The apartments will most likely exceed this distance.	
	Is there space for hot water cylinder near the panels?		
	Is the building in a conservation area?	No	
Biomass 	Is there a local supply and space for storage of biomass fuel or can one be set up?	Storage space is likely to be an issue mainly due to the size of the development. For residential developments, a biomass boiler system is generally more viable for developments with at least 50-100 units. Smaller developments may not generate sufficient heat demand to justify the investment in a biomass boiler system.	Unsuitable
	Is a room heater or boiler required	No boiler room is provided to accommodate the storage of biomass fuel, such as wood pellets or chips. Additionally, the storage space must be accessible for delivery vehicles.	
CHP 	Is a communal heat network proposed?	There is no district system available/proposed.	Unsuitable
Ground Source Heating 	Will there be room for a horizontal buried pipe?	Require a substantial amount of land for the installation of horizontal ground loops. This can be a constraint in urban or densely populated areas where space is limited.	While GSHP can deliver strong carbon and energy performance benefits, they are typically more viable on larger-scale projects due to higher infrastructure and groundworks costs.
	Is the ground suitable for vertical pipe system?	Further assessment of ground conditions required. Local regulations may restrict drilling or excavation needed for GSHP installations. Permits may be required.	
Air Source 	Is there sufficient room within the dwelling to accommodate internal unit.	Houses - The units could be installed to the rear of the buildings; a cylinder would also be required within the dwelling. Apartments - The installation of external ASHP units presents significant challenges in this development. If required, careful consideration	Yes, the inclusion of ASHP hot water cylinders is considered appropriate and has been incorporated into the proposed energy strategy as option 2.

	Is a low temperature heat emitter (i.e. underfloor heating) proposed?	would need to be given to their placement— either mounted on the building’s exterior façade or positioned on a suitably sized flat roof area Radiators and Underfloor heating are currently proposed.	Option 1 is an ASHP for heating and hot water.
	Other problems?	No	
District Heating 	Is there district heating situated close the site.	Currently there is no district heating or cooling systems	Unsuitable

5.1 Air Source Heat Pumps - OPTION 1

Air source heat pumps (ASHPs) use an external heat exchanger to capture energy from the ambient air. They remain operational even at sub-zero external temperatures, although the efficiency (Coefficient of Performance, or CoP) decreases as temperatures fall.



The outdoor unit must be located in free air, typically installed either on a ground plinth or wall mounted. During operation, the fan produces a low-level audible hum, so installation locations should be carefully considered to minimise any potential disturbance.

The proposed development consists primarily of low-density housing, with each dwelling benefitting from private garden space. This makes ASHP installation straightforward for the houses. However, additional consideration will be required for their integration into the apartments.

For the supporting calculations, a Vaillant ASHP has been modelled. At detailed design stage, specific unit sizing will be required to ensure heating capacity matches peak demand.

When combined with demand-reduction measures and complementary renewable technologies, ASHPs can deliver over 50% reductions in carbon emissions compared to baseline Part L 2021 performance, based on SAP 10.1 methodology.

5.1.1 Considerations

Air Source Heat Pumps	
Potential Advantages	Risks & Disadvantages
- Significant carbon reductions, with average savings of around 65% compared with gas boilers. - Offset the carbon intensity of grid electricity used for lighting, pumps, fans, appliances, and equipment. - Well-maintained units typically last up to 20 years, compared with 15 years for a traditional boiler. - Highly efficient use of electricity: a typical ASHP requires only around 25% of the energy input of a conventional gas boiler to deliver the same output. - Substantially lower emissions when calculated using SAP 10.1 factors.	- Performance is dependent on correct design and installation; poor specification can lead to underperformance. - Units must be installed externally with sufficient clearance for airflow, which may be a challenge in restricted plots. - A low-level audible hum from the fan may require consideration of placement in relation to neighbouring properties. - Safe access is required for ongoing maintenance and servicing.
Conclusion	
Air Source Heat Pumps represent a technically feasible and effective solution for the proposed development. The modelling demonstrates that their inclusion can deliver carbon reductions in excess of 50% compared with Part L 2021 requirements, ensuring compliance with Wokingham Borough Council's planning policies on carbon reduction and renewable energy.	

ASHPs are suitable for the majority of dwellings on site, though further consideration will be required to integrate them effectively within the apartments. Overall, they provide a reliable, efficient, and future-proof technology capable of supporting both planning compliance and long-term sustainability objectives.

5.1.2 Energy and CO2 Savings for ASHPs

Westbourne Homes are considering the use of ASHPs to meet the requirements of CP1. Modelling undertaken following demand reduction measures demonstrates that dwellings achieve a minimum 50% reduction in carbon emissions over Part L 2021 requirements.

House Type	Number of Units	TER	DER	% Improvement
Plot 1 Ground Floor	2	12.8	9.55	25.39
Plot 3 1st Floor	2	11.57	7.86	32.07
Plot 5 Semi Det	4	8.44	3.54	58.06
Plot 7 Det	5	8.53	3.59	57.91
Plot 14 Det	2	9.05	3.63	59.89
Plot 19 Det	4	8.49	3.56	58.07
Site Wide	19	8.86	4.42	50.10

Table 5 – Option 2 ASHP Improvement over building regulations under SAP 2021

5.1.3 Air Source Heat Pumps Site Energy Reductions

Table 6 demonstrates a site-wide primary energy saving of over 21% achieved through the installation of ASHP systems operating at a 45° C flow temperature.

These reductions confirm that ASHPs provide substantial efficiency gains compared with conventional systems. Performance is further enhanced by integration with solar PV, thermal batteries, and additional energy efficiency measures.

House Type	Number of Units	Base Case Total Primary energy kWh/year	ASHP Total Primary energy kWh/year	% Improvement
Plot 1 Ground Floor	2	3338.85	3222.24	3.49
Plot 3 1st Floor	2	2987.70	3417.93	-14.40
Plot 5 Semi Det	4	5255.22	3814.13	27.42
Plot 7 Det	5	5084.57	3905.54	23.19
Plot 14 Det	2	6033.85	4123.21	31.67
Plot 19 Det	4	4987.36	3819.66	23.41
Site Wide	19	4555.70	3579.48	21.43

Table 6: Energy reduction for Air Source Heat Pumps

5.2 Heat Pump Hot Water Cylinder – OPTION 2

Heat pump water heaters are a relatively new technology that apply the same principles as an air source heat pump (ASHP) to provide stored domestic hot water. They absorb energy from external air and use a vapour compression cycle to upgrade the heat output.

Typically, these systems achieve a Coefficient of Performance (CoP) of around 3. This means that for every 1 kW of electricity consumed, approximately 3 kW of heat is produced. A product such as the Dimplex Edel offers a highly efficient and cost-effective alternative to a conventional immersion-heated hot water cylinder.



Installation requirements are modest, needing only an electrical connection, two ducts to an external wall (for air intake and exhaust), and cupboard space comparable to a traditional hot water cylinder. Duct terminations would need to maintain standard clearance distances from windows, doors, and service penetrations. Supporting documentation is included within the appendices.

For Option 2, heat pump cylinders have been modelled for the apartments only, in combination with on-site solar PV. This approach is well suited where space heating demands are relatively low, and hot water is primarily delivered via ASHP technology.

5.2.1 Heat Pump Cylinder Site Assessment Carbon Reductions

Table 7 below shows a site-wide carbon reduction of over 57% with the installation of Edle ASHP cylinders providing hot water to the apartments, while the houses utilise full ASHP systems for both heating and hot water.

By replacing conventional heating systems with ASHPs, the development achieves a significant decrease in carbon emissions and overall energy demand. ASHPs extract renewable energy from the air, reducing reliance on fossil fuels and grid electricity while providing effective heating and hot water solutions.

Additional carbon savings can be achieved through integration with PV panels, thermal batteries, and other efficiency measures, further minimising dependency on external energy sources and supporting long-term sustainability.

House Type	Number of Units	TER kgCO ₂ /yr/m ²	DER kgCO ₂ /yr/m ²	% Improvement
Plot 1 Ground Floor	2	12.8	5.2	59.38
Plot 3 1st Floor	2	11.57	5.43	53.07
Plot 5 Semi Det	4	8.44	3.54	58.06
Plot 7 Det	5	8.53	3.59	57.91
Plot 14 Det	2	9.05	3.63	59.89
Plot 19 Det	4	8.49	3.56	58.07
Site Wide	19	8.86	3.74	57.75

Table 7: CO₂ reduction for Air Source Heat Pumps Cylinder

5.2.2 Heat Pump Cylinder Site Energy Reductions

Table 8 below demonstrates a site-wide primary energy reduction of over 26%, based on the installation of Edle ASHP cylinders for the apartments and ASHP systems for the houses. Results are expressed in kWh/year and confirm the significant efficiency improvements across the development.

As with carbon reductions, further energy savings can be realised through integration with solar PV, thermal batteries, and complementary efficiency measures, further reducing reliance on imported energy.

House Type	Number of Units	Base Case Total Primary Energy kWh/year	EDLE Total Primary Energy kWh/year	% Improvement
Plot 1 Ground Floor	2	2627.19	1648.94	37.24
Plot 3 1st Floor	2	2987.70	2207.42	26.12
Plot 5 Semi Det	4	5255.22	3814.13	27.42
Plot 7 Det	5	5084.57	3905.54	23.19
Plot 14 Det	2	6033.85	4123.21	31.67
Plot 19 Det	4	4987.36	3819.66	23.41
Site Wide	19	4484.53	3301.10	26.39

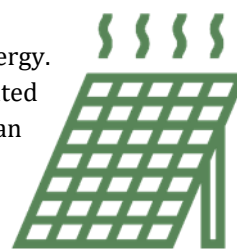
Table 8: Energy reduction for Air Source Heat Pump Cylinders

The use of heat pump hot water cylinders for the apartments, in combination with air source heat pumps for the houses, achieves over 57% carbon reductions and more than 26% site-wide primary energy savings compared with baseline figures.

This approach not only meets but significantly exceeds the energy efficiency and carbon reduction requirements set out in current Building Regulations and Wokingham Borough Council's planning policy. By integrating highly efficient ASHP and heat pump cylinder technology, alongside the potential for solar PV, the development delivers a future-proof, low-carbon energy strategy that supports compliance while enhancing long-term sustainability and occupant affordability.

5.3 Photovoltaic Panels - OPTION 3

Photovoltaic (PV) panels generate electricity by converting sunlight into usable energy. They operate in daylight rather than relying solely on direct sun, making them well-suited to the UK's climate, though performance is naturally higher in full sunlight. Shading can significantly reduce efficiency, so placement is key.



The performance of PV systems depends on property orientation, roof pitch, and weather conditions. While installation costs remain the primary barrier, government grants are available to help offset capital expenditure. Careful consideration should be given to which buildings PV arrays are installed on, both to maximise efficiency and justify the higher upfront investment.

PV systems produce the most energy during daytime hours, which does not fully align with domestic demand patterns (typically morning and evening). However, surplus electricity can support other systems, be stored, or exported back to the grid.

House Type	Option 2 – PV kWp	Option 3 – PV kWp
Plot 1 Ground Floor	0.55	2
Plot 3 1st Floor	0.55	2
Site Summary	2.2	8

Table 9 – Site summary of the PV

5.3.1 Thermal Battery

Traditional hot water cylinders suffer from daily heat losses, which become more significant as building fabric efficiency improves and heating demand decreases. Meeting future standards such as HEM (2026) and SAP 2021 requires higher-performing solutions.

The Sunamp heat battery is one such option, offering vacuum-insulated storage with much lower daily heat loss compared to standard cylinders. This improves energy efficiency and supports carbon reduction targets.

Cylinder	Size	Loss – Liters kWh/24h
Sunamp	150	0.67
HEM - Daily heat loss		0.7095
SAP 2021 - Daily heat loss		1.39

Table 10 – Cylinder Performance

By integrating Sunamp cylinders with PV panels and air-source heat pumps (ASHPs), the development can reduce the PV roof-space requirement while still meeting the client's target of achieving an EPC 'B' rating.

Table 10 demonstrates the potential energy savings when Sunamp cylinders are used in combination with PV for the apartments, alongside ASHPs for heating and hot water to the houses.

5.3.2 PV with Sunamp and ASHP to Houses - Site Assessment Carbon Reductions

Site-wide modelling indicates a carbon reduction of over 57% when apartments are fitted with PV panels and Sunamp heat batteries for electric heating, while houses utilise ASHP systems for heating and hot water. Results are expressed in kWh/year and show significant reductions in overall energy demand across the development.

By replacing conventional heating systems with ASHPs, the development benefits from a substantial decrease in carbon emissions. ASHPs extract renewable heat from the air, reducing reliance on grid electricity and fossil fuels while maintaining effective heating and hot water provision.

Additional carbon savings can be achieved by combining ASHPs with PV and Sunamp systems, further reducing dependence on external energy supply and improving long-term sustainability.

House Type	Number of Units	TER kgCO ₂ /yr/m ²	DER kgCO ₂ /yr/m ²	% Improvement
Plot 1 Ground Floor	2	13.00	5.31	59.15
Plot 3 1st Floor	2	11.74	5.58	52.47
Plot 5 Semi Det	4	8.44	3.54	58.06
Plot 7 Det	5	8.53	3.59	57.91
Plot 14 Det	2	9.05	3.63	59.89
Plot 19 Det	4	8.49	3.56	58.07
Site Wide	19	8.90	3.77	57.63

Table 11: CO₂ reduction for PV Sunamp to apartments and ASHP to houses

5.3.3 Site Energy Reductions

Modelling also shows a site-wide primary energy reduction of 26%, achieved through a combination of PV with Sunamp batteries for the apartments, and ASHPs for heating and hot water in the houses.

House Type	Number of Units	Base Case Total Primary Energy kWh/year	EDLE Total Primary Energy kWh/year	% Improvement
Plot 1 Ground Floor	2	2676.24	1672.26	37.51
Plot 3 1st Floor	2	3037.64	2261.85	25.54
Plot 5 Semi Det	4	5255.22	3814.13	27.42
Plot 7 Det	5	5084.57	3905.54	23.19
Plot 14 Det	2	6033.85	4123.21	31.67
Plot 19 Det	4	4987.36	3819.66	23.41
Site Wide	19	4494.43	3308.87	26.38

Table 12: Energy reduction for PV Sunamp to apartments and ASHP to houses

The proposed energy strategy, which combines photovoltaic panels with Sunamp thermal batteries for the apartments and air source heat pumps for the houses, achieves over 57% carbon reductions and up to 26% primary energy savings across the development.

This integrated approach ensures compliance with Wokingham Borough Council's planning policy requirements for renewable energy and carbon reduction. By maximising roof-mounted PV generation, optimising hot water storage efficiency, and deploying ASHP technology across all dwellings, the development not only meets but significantly exceeds the baseline standards required under current and emerging Building Regulations.

As a result, the scheme delivers a future-proof, sustainable energy solution that supports the client's target EPC ratings and aligns with the council's objectives for low-carbon development.

6. Conclusion

The proposed energy strategy for Ladds Garden Centre (19 dwellings – houses and apartments) demonstrates a robust and future-proof approach to sustainable design. SAP 2021 modelling confirms that the scheme delivers over 50% reductions in CO₂ emissions and up to 26% primary energy savings compared with Part L 2021 baseline standards, significantly exceeding statutory requirements.

Three options have been modelled to show compliance routes:

-  **Option 1:** Air Source Heat Pumps (ASHPs) to all dwellings, achieving site-wide CO₂ reductions of over 50%.
-  **Option 2:** ASHPs to houses, with heat pump hot water cylinders and PV to apartments, achieving over 57% CO₂ reductions and 26% energy savings.
-  **Option 3:** PV panels and Sunamp thermal batteries to apartments combined with ASHPs to houses, again achieving over 57% CO₂ reductions and up to 26% primary energy savings.

This performance goes well beyond Wokingham Borough Council's Local Plan Policy CP1, which requires only a 10% reduction through renewable energy, and directly addresses South East Plan Policy NRM11 by integrating on-site renewable and low-carbon technologies. The strategy also demonstrates alignment with the Council's Climate Emergency Declaration and contributes to the UK's wider Net Zero 2050 commitment by adopting a fabric-first design supported by future-proof renewable systems.

In summary, the development not only meets but exceeds local, regional, and national policy requirements. By offering multiple compliant energy strategy options, the scheme ensures flexibility while delivering affordable, low-carbon, and sustainable homes in line with Wokingham Borough Council's long-term sustainability objectives.

Planning Conclusion

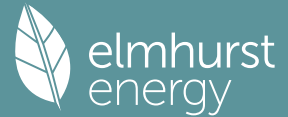
The proposed energy strategy for Ladds Garden Centre (19 houses and apartments) achieves over 50% reductions in carbon emissions compared with Part L 2021, far exceeding Wokingham Borough Council's Policy CP1 requirement of a 10% reduction through renewables.

This confirms full compliance with planning policy while delivering a sustainable, low-carbon development that supports the Council's Climate Emergency objectives.

Requirement	Wokingham Borough Council (Policy CP1)	Proposed Development (19 houses & apartments)	Compliance
Minimum carbon reduction from renewable energy	≥ 10% reduction against Building Regulations baseline	> 50% reduction in carbon emissions (all options)	Exceeds requirement
Energy efficiency	Adopt sustainable design and reduce reliance on fossil fuels	Fabric-first approach: improved insulation, airtightness, low-energy lighting, passive design	Compliant
Renewable / low-carbon technology	Integrate on-site renewable technologies	ASHPs, PV panels, heat pump cylinders, Sunamp thermal batteries	Compliant
Climate Emergency response	Support borough's pathway to net zero carbon	> 57% CO ₂ reduction & up to 26% site-wide primary energy savings	Exceeds requirement

APPENDIX A – SAP 2021

Full SAP Calculation Printout



Property Reference	P1 Ladds			Issued on Date	21/08/2025
Assessment Reference	Grd Flr Flat	Prop Type Ref	Semi		
Property	1, Bath Road, Hare Hatch, Berkshire, RG10 9SA				
SAP Rating	67 D	DER	9.55	TER	12.80
Environmental	94 A	% DER < TER			25.39
CO ₂ Emissions (t/year)	0.43	DFEE	32.19	TFEE	31.50
Compliance Check	See BREL	% DFEE < TFEE			-2.19
% DPER < TPER	-49.11	DPER	100.17	TPER	67.18
Assessor Details	Mrs. Rebecca Lennon			Assessor ID	P627-0001
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	49.7000 (1b)	2.4000 (2b)	119.2800 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.7000		119.2800 (4)
Dwelling volume			119.2800 (5)

2. Ventilation rate

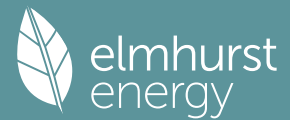
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	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) = 0.1677 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3677 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3125 (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	0.3985	0.3907	0.3828	0.3438	0.3360	0.2969	0.2969	0.2891	0.3125	0.3360	0.3516	0.3672 (22b)
Effective ac	0.5794	0.5763	0.5733	0.5591	0.5564	0.5441	0.5441	0.5418	0.5488	0.5564	0.5618	0.5674 (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							
Ent Door			1.9600	1.2000	2.3520		(26a)
Windows			7.8300	1.1450	8.9656		(27)
Heatloss Floor 1			49.7000	0.1200	5.9640	75.0000	3727.5000 (28a)
External Wall 1	35.7600	9.7900	25.9700	0.2000	5.1940	60.0000	1558.2000 (29a)
Total net area of external elements Aum(A, m ²)			85.4600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.4756		(33)
Main dwelling							
Party Wall 1			36.9600	0.0000	0.0000	70.0000	2587.2000 (32)
Party Ceiling 1			49.7000			20.0000	994.0000 (32b)
Internal Wall 1			69.1200			9.0000	622.0800 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9488.9800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							190.9252 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				5.7300	0.0480	0.2750	
E3 Sill				4.8000	0.0450	0.2160	
E4 Jamb				13.8000	0.0510	0.7038	
E5 Ground floor (normal)				14.9000	0.0640	0.9536	
E16 Corner (normal)				2.4000	0.0570	0.1368	

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E18 Party wall between dwellings	4.8000	0.0620	0.2976	
P1 Party wall - Ground floor	15.4000	0.3200	4.9280	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				7.5108 (36)
Point Thermal bridges				0.0000
Total fabric heat loss		(33) + (36) + (36a) =		29.9865 (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	22.8061	22.6847	22.5658	22.0071	21.9026	21.4160	21.4160	21.3259	21.6035	21.9026	22.1141	22.3351 (38)
Average = Sum(39)m / 12 =	52.7926	52.6712	52.5523	51.9936	51.8891	51.4025	51.4025	51.3124	51.5899	51.8891	52.1005	52.3216 (39)
												51.9931
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0622	1.0598	1.0574	1.0461	1.0440	1.0343	1.0343	1.0324	1.0380	1.0440	1.0483	1.0527 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

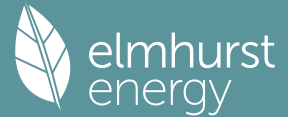
4. Water heating energy requirements (kWh/year)												
Assumed occupancy												1.6813 (42)
Hot water usage for mixer showers												
Hot water usage for baths	51.0848	50.3027	49.1501	47.3770	45.7883	43.5658	41.8079	43.8630	44.8966	47.0979	49.3904	51.0387 (42a)
Hot water usage for other uses	22.1556	21.8212	21.3454	20.6328	19.9907	19.1067	18.4360	19.2561	19.6865	20.5624	21.4731	22.1380 (42b)
Average daily hot water use (litres/day)	31.8479	30.6898	29.5317	28.3736	27.2155	26.0574	26.0574	27.2155	28.3736	29.5317	30.6898	31.8479 (42c)
												96.5923 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	105.0883	102.8136	100.0271	96.3834	92.9945	88.7298	86.3013	90.3346	92.9567	97.1920	101.5532	105.0246 (44)
Energy content (annual)	154.7081	136.0432	142.9367	125.9008	119.8328	102.6131	95.3655	106.3254	107.8251	125.2417	137.2526	154.2364 (45)
Distribution loss (46)m = 0.15 x (45)m	23.2062	20.4065	21.4405	18.8851	17.9749	15.3920	14.3048	15.9488	16.1738	18.7863	20.5879	23.1355 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.9400 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.5076 (55)
Total storage loss	15.7356	14.2128	15.7356	15.2280	15.7356	15.2280	15.7356	15.7356	15.2280	15.7356	15.2280	15.7356 (56)
If cylinder contains dedicated solar storage	15.7356	14.2128	15.7356	15.2280	15.7356	15.2280	15.7356	15.7356	15.2280	15.7356	15.2280	15.7356 (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	193.7061	171.2672	181.9347	163.6408	158.8308	140.3531	134.3635	145.3234	145.5651	164.2397	174.9926	193.2344 (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	193.7061	171.2672	181.9347	163.6408	158.8308	140.3531	134.3635	145.3234	145.5651	164.2397	174.9926	193.2344 (64)
12Total per year (kWh/year)												1967.4514 (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	82.6388	73.4136	78.7249	72.0540	71.0428	64.3109	62.9074	66.5516	66.0438	72.8413	75.8285	82.4820 (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	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.3042	85.5868	77.3042	79.8810	77.3042	79.8810	77.3042	77.3042	79.8810	77.3042	79.8810	77.3042 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	146.4548	147.9745	144.1448	135.9919	125.7002	116.0275	109.5655	108.0457	111.8754	120.0284	130.3201	139.9928 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064 (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)	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509 (71)
Water heating gains (Table 5)	111.0737	109.2464	105.8130	100.0750	95.4876	89.3206	84.5530	89.4511	91.7276	97.9049	105.3173	110.8629 (72)
Total internal gains	383.0518	391.0268	375.4811	364.1670	346.7111	333.4482	319.6418	323.0201	331.7031	343.4566	363.7375	376.3790 (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	5.4000	10.6334	0.5100	0.0000	0.7700	22.5490 (74)						
South	2.4300	46.7521	0.5100	0.0000	0.7700	44.6137 (78)						
Solar gains	67.1626	116.1579	166.2969	222.8092	268.0576	275.1069	261.4292	225.7334	185.2647	130.1039	80.6995	57.3482 (83)
Total gains	450.2144	507.1847	541.7780	586.9762	614.7687	608.5550	581.0710	548.7535	516.9678	473.5605	444.4370	433.7273 (84)

7. Mean internal temperature (heating season)												
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)

Full SAP Calculation Printout



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	49.9280	50.0430	50.1563	50.6952	50.7973	51.2782	51.2782	51.3682	51.0919	50.7973	50.5912	50.3774
alpha	4.3285	4.3362	4.3438	4.3797	4.3865	4.4185	4.4185	4.4245	4.4061	4.3865	4.3727	4.3585
util living area	0.9726	0.9538	0.9217	0.8412	0.7049	0.5236	0.3855	0.4242	0.6408	0.8633	0.9507	0.9761 (86)
Living	20.0281	20.1891	20.3952	20.6537	20.8292	20.9089	20.9256	20.9235	20.8794	20.6630	20.3152	20.0025
Non living	18.9105	19.1127	19.3679	19.6808	19.8715	19.9520	19.9634	19.9639	19.9267	19.7001	19.2804	18.8847
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	31	28	31	30	31	30	31	31	30	31	30	31
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000 (87)
Th 2	20.0318	20.0338	20.0358	20.0451	20.0468	20.0549	20.0549	20.0564	20.0518	20.0468	20.0433	20.0396 (88)
util rest of house	0.9664	0.9438	0.9047	0.8088	0.6517	0.4525	0.3045	0.3399	0.5681	0.8281	0.9384	0.9707 (89)
MIT 2	20.0318	20.0338	20.0358	20.0451	20.0468	20.0549	20.0549	20.0564	20.0518	20.0468	20.0433	20.0396 (90)
Living area fraction									FLA = Living area / (4) =			
MIT	20.4760	20.4771	20.4781	20.4831	20.4841	20.4885	20.4885	20.4893	20.4868	20.4841	20.4822	20.4802 (91)
Temperature adjustment												0.0000
adjusted MIT	20.4760	20.4771	20.4781	20.4831	20.4841	20.4885	20.4885	20.4893	20.4868	20.4841	20.4822	20.4802 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9694	0.9486	0.9129	0.8244	0.6769	0.4857	0.3420	0.3790	0.6025	0.8453	0.9444	0.9734 (94)
Useful gains	436.4349	481.1270	494.6144	483.9136	416.1634	295.5694	198.6985	207.9783	311.4952	400.2977	419.7464	422.1825 (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	853.9707	820.4624	734.5821	602.2493	455.7979	302.6817	199.8766	209.8304	329.4931	512.8759	697.2187	851.8058 (97)
Space heating kWh	310.6467	228.0334	178.5360	85.2017	29.4881	0.0000	0.0000	0.0000	0.0000	83.7582	199.7801	319.6397 (98a)
Space heating requirement - total per year (kWh/year)												1435.0837
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	310.6467	228.0334	178.5360	85.2017	29.4881	0.0000	0.0000	0.0000	0.0000	83.7582	199.7801	319.6397 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1435.0837
Space heating per m2										(98c) / (4) =		28.8749 (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 %)												130.2138 (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	310.6467	228.0334	178.5360	85.2017	29.4881	0.0000	0.0000	0.0000	0.0000	83.7582	199.7801	319.6397 (98)
Space heating efficiency (main heating system 1)	130.2138	130.2138	130.2138	130.2138	130.2138	0.0000	0.0000	0.0000	0.0000	130.2138	130.2138	130.2138 (210)
Space heating fuel (main heating system)	238.5665	175.1222	137.1098	65.4321	22.6459	0.0000	0.0000	0.0000	0.0000	64.3235	153.4246	245.4729 (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	193.7061	171.2672	181.9347	163.6408	158.8308	140.3531	134.3635	145.3234	145.5651	164.2397	174.9926	193.2344 (64)
Efficiency of water heater	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month	193.7061	171.2672	181.9347	163.6408	158.8308	140.3531	134.3635	145.3234	145.5651	164.2397	174.9926	193.2344 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	18.9190	15.1775	13.6657	10.0121	7.7336	6.3184	7.0549	9.1702	11.9111	15.6281	17.6519	19.4448 (232)
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 (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												1102.0977 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												100.0000
Water heating fuel used												1967.4514 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												152.6873 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)

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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	3222.2364 (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 (high-rate cost)	881.6782	0.1639	144.5162 (261)
Space heating - main system 1 (low-rate cost)	220.4195	0.1376	30.3322 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating - high rate cost	1377.2160	0.1478	203.6134 (264)
Water heating - low rate cost	590.2354	0.1241	73.2386 (264)
Space and water heating			451.7004 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	152.6873	0.1490	22.7534 (268)
Total CO2, kg/year			474.4538 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			9.5500 (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 (high-rate cost)	881.6782	1.2888	1420.3493 (275)
Space heating - main system 1 (low-rate cost)	220.4195	1.4983	330.2445 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating - high rate cost	1377.2160	1.5527	2138.3451 (278)
Water heating - low rate cost	590.2354	1.4440	852.3137 (278)
Space and water heating			4741.2525 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	152.6873	1.5547	237.3898 (282)
Total Primary energy kWh/year			4978.6423 (286)
Dwelling Primary energy Rate (DPER)			100.1700 (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	49.7000 (1b)	x 2.4000 (2b)	= 119.2800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 119.2800 (5)

2. Ventilation rate

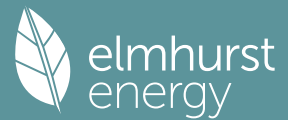
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.1677 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4177 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3550 (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	0.4527	0.4438	0.4349	0.3905	0.3816	0.3373	0.3373	0.3284	0.3550	0.3816	0.3994	0.4172 (22b)
Effective ac	0.6024	0.5985	0.5946	0.5763	0.5728	0.5569	0.5569	0.5539	0.5630	0.5728	0.5798	0.5870 (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 Semi-glazed door			1.9600	1.0000	1.9600		(26a)

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TER Opening Type				7.8300	1.1450	8.9656	(27)
Heatloss Floor 1				49.7000	0.1300	6.4610	(28a)
External Wall 1	35.7600	9.7900		25.9700	0.1800	4.6746	(29a)
Total net area of external elements Aum(A, m2)				85.4600			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =		22.0612	(33)
Main dwelling							
Party Wall 1			36.9600	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 200.9252 (35)

List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				5.7300	0.0500	0.2865	
E3 Sill				4.8000	0.0500	0.2400	
E4 Jamb				13.8000	0.0500	0.6900	
E5 Ground floor (normal)				14.9000	0.1600	2.3840	
E16 Corner (normal)				2.4000	0.0900	0.2160	
E18 Party wall between dwellings				4.8000	0.0600	0.2880	
P1 Party wall - Ground floor				15.4000	0.0800	1.2320	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.3365 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 27.3977 (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	23.7138	23.5572	23.4037	22.6828	22.5479	21.9200	21.9200	21.8037	22.1618	22.5479	22.8207	23.1060	(38)
Average = Sum(39)m / 12 =	51.1115	50.9549	50.8014	50.0805	49.9456	49.3177	49.3177	49.2014	49.5596	49.9456	50.2185	50.5038	(39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0284	1.0253	1.0222	1.0077	1.0049	0.9923	0.9923	0.9900	0.9972	1.0049	1.0104	1.0162	(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													1.6813 (42)
Hot water usage for mixer showers													
Hot water usage for baths	52.4089	51.6213	50.4736	48.2777	46.6572	44.8500	43.8228	44.9618	46.2103	48.1507	50.3938	52.2081	(42a)
Hot water usage for other uses	22.6608	22.3242	21.8503	20.9765	20.3221	19.5966	19.2047	19.6753	20.1877	20.9641	21.8559	22.5842	(42b)
Average daily hot water use (litres/day)	31.8479	30.6898	29.5317	28.3736	27.2155	26.0574	26.0574	27.2155	28.3736	29.5317	30.6898	31.8479	(42c)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	106.9176	104.6353	101.8556	97.6277	94.1948	90.5040	89.0849	91.8526	94.7717	98.6465	102.9395	106.6401	(44)
Energy content (annual)	169.3313	148.9993	156.5482	133.6475	126.8043	111.2852	107.7404	113.7327	116.8629	133.8623	146.6562	166.9727	(45)
Distribution loss (46)m = 0.15 x (45)m													

Water storage loss:													
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.3938 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
Primary 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	(57)
Combi 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)
Total heat required for water heating calculated for each month	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)
WWHRS	215.9262	191.0850	203.1431	178.7393	173.3992	156.3770	154.3353	160.3276	161.9548	180.4572	191.7480	213.5676	(62)
PV diverter	-23.9592	-21.1897	-22.1886	-18.3730	-17.1230	-14.6523	-13.7342	-14.6049	-15.1598	-17.8718	-20.2465	-23.5155	(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)

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)
Heat gains from water heating, kWh/month	93.5786	83.2108	89.3282	80.5113	79.4384	73.0758	73.0996	75.0920	74.9304	81.7852	84.8366	92.7943	(65)

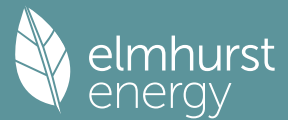
5. Internal gains (see Table 5 and 5a)

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	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	77.3042	85.5868	77.3042	79.8810	77.3042	77.3042	77.3042	77.3042	79.8810	77.3042	79.8810	77.3042	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	146.4548	147.9745	144.1448	135.9919	125.7002	116.0275	109.5655	108.0457	111.8754	120.0284	130.3201	139.9928	(68)
Pumps, fans	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	(69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	(71)
Total internal gains	125.7776	123.8256	120.0648	111.8212	106.7720	101.4942	98.2522	100.9302	104.0700	109.9263	117.8287	124.7236	(72)

6. Solar gains

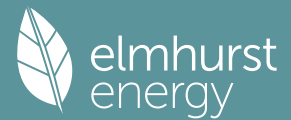
[Jan]	Area	Solar flux	g	FF	Access	Gains
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	m2				Table 6a W/m2	Specific data or Table 6b		Specific data or Table 6c	factor Table 6d		W	
North	5.4000				10.6334	0.6300		0.7000	0.7700		17.5484 (74)	
South	2.4300				46.7521	0.6300		0.7000	0.7700		34.7199 (78)	
Solar gains	52.2683	90.3982	129.4181	173.3980	208.6119	214.0979	203.4535	175.6737	144.1795	101.2514	62.8032	44.6304 (83)
Total gains	453.0241	499.0042	522.1511	552.3112	569.6074	559.7196	536.7944	510.1729	488.2250	459.7294	442.0520	437.8701 (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	54.2712	54.4380	54.6025	55.3885	55.5381	56.2452	56.2452	56.3781	55.9707	55.5381	55.2363	54.9243
alpha	4.6181	4.6292	4.6402	4.6926	4.7025	4.7497	4.7497	4.7585	4.7314	4.7025	4.6824	4.6616
util living area	0.9741	0.9582	0.9311	0.8603	0.7316	0.5471	0.4010	0.4384	0.6557	0.8709	0.9533	0.9773 (86)
MIT	19.9191	20.1022	20.3425	20.6554	20.8741	20.9751	20.9953	20.9930	20.9423	20.6863	20.2719	19.8945 (87)
Th 2	20.0597	20.0623	20.0649	20.0770	20.0792	20.0897	20.0897	20.0917	20.0857	20.0792	20.0746	20.0699 (88)
util rest of house	0.9681	0.9488	0.9155	0.8298	0.6795	0.4757	0.3196	0.3543	0.5837	0.8365	0.9412	0.9720 (89)
MIT 2	18.8252	19.0553	19.3537	19.7341	19.9728	20.0745	20.0880	20.0888	20.0461	19.7787	19.2792	18.8019 (90)
Living area fraction	19.3270	19.5355	19.8073	20.1567	20.3863	20.4876	20.5042	20.5036	20.4572	20.1951	19.7346	19.3031 (92)
MIT	19.3270	19.5355	19.8073	20.1567	20.3863	20.4876	20.5042	20.5036	20.4572	20.1951	19.7346	19.3031 (93)
Temperature adjustment												0.0000
adjusted MIT	19.3270	19.5355	19.8073	20.1567	20.3863	20.4876	20.5042	20.5036	20.4572	20.1951	19.7346	19.3031 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9622	0.9425	0.9105	0.8327	0.6976	0.5075	0.3569	0.3928	0.6140	0.8413	0.9359	0.9665 (94)
Useful gains	435.9136	470.3105	475.4074	459.8922	397.3820	284.0322	191.5971	200.4135	299.7510	386.7790	413.7352	423.2076 (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	768.0548	745.7533	676.0310	563.7432	433.8404	290.3652	192.5475	201.9021	315.0621	479.2308	634.4910	762.7635 (97)
Space heating kWh	247.1130	185.0976	149.2639	74.7728	27.1250	0.0000	0.0000	0.0000	0.0000	68.7841	158.9442	252.6296 (98a)
Space heating requirement - total per year (kWh/year)												1163.7302
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	247.1130	185.0976	149.2639	74.7728	27.1250	0.0000	0.0000	0.0000	0.0000	68.7841	158.9442	252.6296 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1163.7302
Space heating per m2										(98c) / (4) =		23.4151 (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	247.1130	185.0976	149.2639	74.7728	27.1250	0.0000	0.0000	0.0000	0.0000	68.7841	158.9442	252.6296 (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)	267.7281	200.5391	161.7160	81.0106	29.3879	0.0000	0.0000	0.0000	0.0000	74.5223	172.2039	273.7049 (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	191.9670	169.8953	180.9545	160.3663	156.2762	141.7247	140.6011	145.7227	146.7950	162.5855	171.5015	190.0521 (64)
Efficiency of water heater (217)m	84.6272	84.2524	83.6314	82.4575	81.0144	79.8000	79.8000	79.8000	79.8000	82.2791	83.8896	79.8000 (216)
Fuel for water heating, kWh/month	226.8386	201.6505	216.3716	194.4835	192.8993	177.5999	176.1919	182.6099	183.9536	197.6023	204.4371	84.6989 (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	16.0623	12.8858	11.6022	8.5003	6.5659	5.3644	5.9896	7.7855	10.1126	13.2683	14.9865	16.5087 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-23.7136	-33.6724	-48.7652	-55.2905	-60.0607	-56.2761	-55.6371	-52.3390	-46.5376	-38.7698	-26.1773	-20.4783 (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)	-12.6717	-26.7391	-53.2786	-80.1924	-106.1695	-106.6736	-105.3632	-89.1018	-65.2025	-38.2323	-16.9215	-10.0097 (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												1260.8127 (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	79.8000	
Water heating fuel used	2379.0237	(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)	129.6319	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1228.2735	(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	2627.1947	(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	1260.8127	0.2100	264.7707 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2379.0237	0.2100	499.5950 (264)
Space and water heating			764.3656 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	129.6319	0.1443	18.7099 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-517.7176	0.1344	-69.5804
PV Unit electricity exported	-710.5559	0.1258	-89.4204
Total			-159.0008 (269)
Total CO2, kg/year			636.0040 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.8000 (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	1260.8127	1.1300	1424.7184 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2379.0237	1.1300	2688.2967 (278)
Space and water heating			4113.0151 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	129.6319	1.5338	198.8337 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-517.7176	1.4967	-774.8692
PV Unit electricity exported	-710.5559	0.4619	-328.2336
Total			-1103.1028 (283)
Total Primary energy kWh/year			3338.8468 (286)
Target Primary Energy Rate (TPER)			67.1800 (287)

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Property Reference	P1 Ladds			Issued on Date	21/08/2025
Assessment Reference	Grd Flr Flat	Prop Type Ref	Semi		
Property	1, Bath Road, Hare Hatch, Berkshire, RG10 9SA				
SAP Rating	67 D	DER	9.55	TER	12.80
Environmental	94 A	% DER < TER			25.39
CO ₂ Emissions (t/year)	0.43	DFEE	32.19	TFEE	31.50
Compliance Check	See BREL	% DFEE < TFEE			-2.19
% DPER < TPER	-49.11	DPER	100.17	TPER	67.18
Assessor Details	Mrs. Rebecca Lennon			Assessor ID	P627-0001
Client					

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	49.7000	2.4000	119.2800
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.7000		
Dwelling volume			

2. Ventilation rate

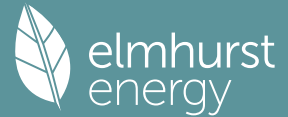
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	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) = 0.1677 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3677 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3125 (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	0.3985	0.3907	0.3828	0.3438	0.3360	0.2969	0.2969	0.2891	0.3125	0.3360	0.3516	0.3672 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5794	0.5763	0.5733	0.5591	0.5564	0.5441	0.5441	0.5418	0.5488	0.5564	0.5618	0.5674 (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							
Ent Door			1.9600	1.2000	2.3520		(26a)
Windows			7.8300	1.1450	8.9656		(27)
Heatloss Floor 1			49.7000	0.1200	5.9640	75.0000	3727.5000 (28a)
External Wall 1	35.7600	9.7900	25.9700	0.2000	5.1940	60.0000	1558.2000 (29a)
Total net area of external elements Aum(A, m ²)			85.4600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.4756		(33)
Main dwelling							
Party Wall 1			36.9600	0.0000	0.0000	70.0000	2587.2000 (32)
Party Ceiling 1			49.7000			30.0000	1491.0000 (32b)
Internal Wall 1			69.1200			9.0000	622.0800 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		9985.9800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							200.9252 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				5.7300	0.0480	0.2750	
E3 Sill				4.8000	0.0450	0.2160	
E4 Jamb				13.8000	0.0510	0.7038	

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E5 Ground floor (normal)	14.9000	0.0640	0.9536										
E16 Corner (normal)	2.4000	0.0570	0.1368										
E18 Party wall between dwellings	4.8000	0.0620	0.2976										
P1 Party wall - Ground floor	15.4000	0.3200	4.9280										
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				7.5108 (36)									
Point Thermal bridges			(36a) =	0.0000									
Total fabric heat loss		(33) + (36) + (36a) =		29.9865 (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	22.8061	22.6847	22.5658	22.0071	21.9026	21.4160	21.4160	21.3259	21.6035	21.9026	22.1141	22.3351	(38)
Average = Sum(39)m / 12 =	52.7926	52.6712	52.5523	51.9936	51.8891	51.4025	51.4025	51.3124	51.5899	51.8891	52.1005	52.3216	(39)
	31.8479	30.6898	29.5317	28.3736	27.2155	26.0574	26.0574	27.2155	28.3736	29.5317	30.6898	31.8479	
HLP	1.0622	1.0598	1.0574	1.0461	1.0440	1.0343	1.0343	1.0324	1.0380	1.0440	1.0483	1.0527	(40)
HLP (average)												1.0461	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	
												31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6813 (42)
Hot water usage for mixer showers													0.0000 (42a)
Hot water usage for baths													22.1556 (42b)
Hot water usage for other uses													31.8479 (42c)
Average daily hot water use (litres/day)													49.4961 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	54.0035	52.5110	50.8770	49.0064	47.2062	45.1641	44.4934	46.4716	48.0601	50.0941	52.1629	53.9859	(44)
Energy content (annual)	79.5025	69.4826	72.7023	64.0146	60.8299	52.2307	49.1665	54.6979	55.7473	64.5513	70.4999	79.2823	(45)
Distribution loss (46)m = 0.15 x (45)m													772.7079
Water storage loss:													
Total storage loss:													
If cylinder contains dedicated solar storage													
Primary loss													0.0000 (57)
Combi loss													0.0000 (59)
Total heat required for water heating calculated for each month													
WWHRS	67.5771	59.0602	61.7969	54.4124	51.7054	44.3961	41.7915	46.4932	47.3852	54.8686	59.9249	67.3900	(62)
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	(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	67.5771	59.0602	61.7969	54.4124	51.7054	44.3961	41.7915	46.4932	47.3852	54.8686	59.9249	67.3900	(64)
12Total per year (kWh/year)													656.8017 (64)
Electric shower(s)	41.9708	37.3963	40.8353	38.9687	39.6999	37.8698	39.1322	39.6999	38.9687	40.8353	40.0675	41.9708	(64a)
Heat gains from water heating, kWh/month	27.3870	24.1141	25.6581	23.3453	22.8513	20.5665	20.2309	21.5483	21.5885	23.9260	24.9981	27.3402	(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	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.3042	85.5868	77.3042	79.8810	77.3042	79.8810	77.3042	77.3042	79.8810	77.3042	79.8810	77.3042	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	146.4548	147.9745	144.1448	135.9919	125.7002	116.0275	109.5655	108.0457	111.8754	120.0284	130.3201	139.9928	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	(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)	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	(71)
Water heating gains (Table 5)	36.8104	35.8841	34.4866	32.4240	30.7142	28.5646	27.1921	28.9627	29.9840	32.1586	34.7196	36.7476	(72)
Total internal gains	308.7885	317.6645	304.1548	296.5159	281.9376	272.6921	262.2809	262.5318	269.9595	277.7103	293.1398	302.2637	(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				5.4000	10.6334		0.5100		0.0000		0.7700		22.5490 (74)
South				2.4300	46.7521		0.5100		0.0000		0.7700		44.6137 (78)
Solar gains	67.1626	116.1579	166.2969	222.8092	268.0576	275.1069	261.4292	225.7334	185.2647	130.1039	80.6995	57.3482	(83)
Total gains	375.9512	433.8225	470.4517	519.3252	549.9953	547.7990	523.7101	488.2651	455.2242	407.8142	373.8392	359.6119	(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	

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tau	52.5431	52.6641	52.7833	53.3505	53.4579	53.9639	53.9639	54.0587	53.7679	53.4579	53.2410	53.0160
alpha	4.5029	4.5109	4.5189	4.5567	4.5639	4.5976	4.5976	4.6039	4.5845	4.5639	4.5494	4.5344
util living area	0.9875	0.9756	0.9535	0.8889	0.7629	0.5761	0.4266	0.4745	0.7080	0.9138	0.9755	0.9897 (86)
MIT	19.6718	19.8941	20.1834	20.5626	20.8354	20.9650	20.9928	20.9886	20.9119	20.5637	20.0615	19.6359 (87)
Th 2	20.0318	20.0338	20.0358	20.0451	20.0468	20.0549	20.0549	20.0564	20.0518	20.0468	20.0433	20.0396 (88)
util rest of house	0.9844	0.9696	0.9418	0.8619	0.7110	0.5001	0.3375	0.3813	0.6339	0.8867	0.9684	0.9870 (89)
MIT 2	18.8336	19.0536	19.3369	19.7006	19.9369	20.0380	20.0528	20.0527	20.0034	19.7109	19.2280	18.8040 (90)
Living area fraction									FLA = Living area /	(4) =		0.4588 (91)
MIT	19.2181	19.4392	19.7253	20.0961	20.3491	20.4633	20.4840	20.4820	20.4202	20.1021	19.6104	19.1856 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2181	19.4392	19.7253	20.0961	20.3491	20.4633	20.4840	20.4820	20.4202	20.1021	19.6104	19.1856 (93)

8. Space heating requirement

Utilisation	Jan 0.9810	Feb 0.9651	Mar 0.9373	Apr 0.8635	May 0.7284	Jun 0.5337	Jul 0.3784	Aug 0.4240	Sep 0.6642	Oct 0.8885	Nov 0.9644	Dec 0.9840 (94)
Useful gains	368.7947	418.6737	440.9686	448.4245	400.6011	292.3768	198.1757	207.0068	302.3460	362.3542	360.5184	353.8553 (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	787.5666	765.7956	695.0172	582.1237	448.7927	301.3862	199.6486	209.4578	326.0589	493.0570	651.7973	784.0727 (97)
Space heating kWh	311.5663	233.2659	189.0122	96.2635	35.8546	0.0000	0.0000	0.0000	0.0000	97.2429	209.7208	320.0818 (98a)
Space heating requirement - total per year (kWh/year)												1493.0079
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	311.5663	233.2659	189.0122	96.2635	35.8546	0.0000	0.0000	0.0000	0.0000	97.2429	209.7208	320.0818 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1493.0079
Space heating per m2										(98c) / (4) =		30.0404 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

Ext. temp.	Jan 4.3000	Feb 4.9000	Mar 6.5000	Apr 8.9000	May 11.7000	Jun 14.6000	Jul 16.6000	Aug 16.4000	Sep 14.1000	Oct 10.6000	Nov 7.1000	Dec 4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	483.1838	380.3787	389.9744	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9025	0.9466	0.9276	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	436.0731	360.0600	361.7499	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	610.4515	583.9922	543.9635	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	125.5525	166.6055	135.5669	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area /	(4) =		1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	31.3881	41.6514	33.8917	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												106.9312 (107)
Energy for space heating												30.0404 (99)
Energy for space cooling												2.1515 (108)
Total												32.1919 (109)
Fabric Energy Efficiency (DFEE)												32.2 (109)

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

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

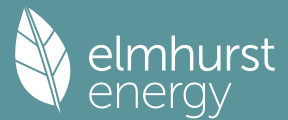
1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	49.7000 (1b)	x 2.4000 (2b)	= 119.2800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	119.2800 (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) = 0.1677 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4177 (18)
Number of sides sheltered	2 (19)

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Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3550 (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	0.4527	0.4438	0.4349	0.3905	0.3816	0.3373	0.3373	0.3284	0.3550	0.3816	0.3994	0.4172	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													(23c)
Effective ac	0.6024	0.5985	0.5946	0.5763	0.5728	0.5569	0.5569	0.5539	0.5630	0.5728	0.5798	0.5870	(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 Semi-glazed door			1.9600	1.0000	1.9600			(26a)
TER Opening Type			7.8300	1.1450	8.9656			(27)
Heatloss Floor 1			49.7000	0.1300	6.4610			(28a)
External Wall 1	35.7600	9.7900	25.9700	0.1800	4.6746			(29a)
Total net area of external elements Aum(A, m2)			85.4600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.0612			(33)
Main dwelling								
Party Wall 1			36.9600	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							200.9252	(35)

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

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	5.7300	0.0500	0.2865	
E3 Sill	4.8000	0.0500	0.2400	
E4 Jamb	13.8000	0.0500	0.6900	
E5 Ground floor (normal)	14.9000	0.1600	2.3840	
E16 Corner (normal)	2.4000	0.0900	0.2160	
E18 Party wall between dwellings	4.8000	0.0600	0.2880	
P1 Party wall - Ground floor	15.4000	0.0800	1.2320	

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

Point Thermal bridges

Total fabric heat loss

(33a) = 0.0000
(33) + (36) + (36a) = 27.3977 (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	23.7138	23.5572	23.4037	22.6828	22.5479	21.9200	21.9200	21.8037	22.1618	22.5479	22.8207	23.1060	(38)
Heat transfer coeff	51.1115	50.9549	50.8014	50.0805	49.9456	49.3177	49.3177	49.2014	49.5596	49.9456	50.2185	50.5038	(39)
Average = Sum(39)m / 12 =												50.0799	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0284	1.0253	1.0222	1.0077	1.0049	0.9923	0.9923	0.9900	0.9972	1.0049	1.0104	1.0162	(40)
HLP (average)												1.0076	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6813	(42)
Hot water usage for mixer showers	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	(42a)
Hot water usage for baths	22.6608	22.3242	21.8503	20.9765	20.3221	19.5966	19.2047	19.6753	20.1877	20.9641	21.8559	22.5842	22.5842	(42b)
Hot water usage for other uses	31.8479	30.6898	29.5317	28.3736	27.2155	26.0574	26.0574	27.2155	28.3736	29.5317	30.6898	31.8479	31.8479	(42c)
Average daily hot water use (litres/day)													49.9627	(43)
Daily hot water use	54.5087	53.0140	51.3820	49.3501	47.5376	45.6540	45.2621	46.8908	48.5613	50.4958	52.5457	54.4321	54.4321	(44)
Energy conte	86.3284	75.4913	78.9722	67.5578	63.9948	56.1369	54.7406	58.0606	59.8810	68.5223	74.8610	85.2275	85.2275	(45)
Energy content (annual)										Total = Sum(45)m =		829.7742		
Distribution loss (46)m = 0.15 x (45)m	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	(46)
Water storage loss:														
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	73.3791	64.1676	67.1264	57.4241	54.3956	47.7164	46.5295	49.3515	50.8988	58.2439	63.6318	72.4433	72.4433	(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	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	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	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	0.0000	(63d)
Output from w/h	73.3791	64.1676	67.1264	57.4241	54.3956	47.7164	46.5295	49.3515	50.8988	58.2439	63.6318	72.4433	72.4433	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		705.3081	705	(64)
Electric shower(s)	41.9708	37.3963	40.8353	38.9687	39.6999	37.8698	39.1322	39.6999	38.9687	40.8353	40.0675	41.9708	41.9708	(64a)
Heat gains from water heating, kWh/month	28.8375	25.3910	26.9904	24.0982	23.5239	21.3966	21.4154	22.2629	22.4669	24.7698	25.9248	28.6035	28.6035	(65)

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

Metabolic gains (Table 5), Watts														
(66)m	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.3042	85.5868	77.3042	79.8810	77.3042	79.8810	77.3042	77.3042	79.8810	77.3042	79.8810	77.3042	77.3042	(67)

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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	146.4548	147.9745	144.1448	135.9919	125.7002	116.0275	109.5655	108.0457	111.8754	120.0284	130.3201	139.9928 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064 (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)	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509 (71)
Water heating gains (Table 5)	38.7601	37.7842	36.2775	33.4697	31.6181	29.7174	28.7842	29.9232	31.2040	33.2928	36.0067	38.4456 (72)
Total internal gains	310.7381	319.5646	305.9456	297.5616	282.8416	273.8450	263.8729	263.4922	271.1795	278.8445	294.4269	303.9617 (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						5.4000	10.6334	0.6300	0.7000	0.7700	17.5484 (74)	
South						2.4300	46.7521	0.6300	0.7000	0.7700	34.7199 (78)	
Solar gains	52.2683	90.3982	129.4181	173.3980	208.6119	214.0979	203.4535	175.6737	144.1795	101.2514	62.8032	44.6304 (83)
Total gains	363.0065	409.9628	435.3637	470.9597	491.4535	487.9429	467.3264	439.1659	415.3590	380.0959	357.2301	348.5921 (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	54.2712	54.4380	54.6025	55.3885	55.5381	56.2452	56.2452	56.3781	55.9707	55.5381	55.2363	54.9243
alpha	4.6181	4.6292	4.6402	4.6926	4.7025	4.7497	4.7497	4.7585	4.7314	4.7025	4.6824	4.6616
util living area	0.9888	0.9794	0.9624	0.9104	0.8006	0.6154	0.4578	0.5045	0.7370	0.9257	0.9783	0.9906 (86)
MIT	19.7032	19.9011	20.1661	20.5332	20.8128	20.9595	20.9919	20.9873	20.9054	20.5584	20.0825	19.6773 (87)
Th 2	20.0597	20.0623	20.0649	20.0770	20.0792	20.0897	20.0897	20.0917	20.0857	20.0792	20.0746	20.0699 (88)
util rest of house	0.9860	0.9743	0.9527	0.8873	0.7526	0.5393	0.3662	0.4099	0.6656	0.9017	0.9720	0.9882 (89)
MIT 2	18.8863	19.0833	19.3447	19.7033	19.9510	20.0697	20.0872	20.0875	20.0324	19.7347	19.2735	18.8685 (90)
Living area fraction	19.2610	19.4585	19.7215	20.0840	20.3464	20.4779	20.5022	20.5003	FLA = Living area / (4) =	20.4329	20.1126	19.6447 (91)
MIT	19.2610	19.4585	19.7215	20.0840	20.3464	20.4779	20.5022	20.5003	20.4329	20.1126	19.6447	19.2395 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2610	19.4585	19.7215	20.0840	20.3464	20.4779	20.5022	20.5003	20.4329	20.1126	19.6447	19.2395 (93)

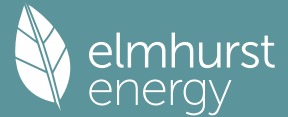
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9829	0.9702	0.9485	0.8875	0.7675	0.5727	0.4082	0.4532	0.6943	0.9027	0.9683	0.9855 (94)
Useful gains	356.8019	397.7500	412.9359	417.9808	377.1786	279.4394	190.7652	199.0169	288.3701	343.1155	345.9218	343.5324 (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	764.6817	741.8250	671.6719	560.1022	431.8482	289.8829	192.4495	201.7398	313.8555	475.1116	629.9737	759.5520 (97)
Space heating kWh	303.4625	231.2184	192.4995	102.3275	40.6742	0.0000	0.0000	0.0000	0.0000	98.2051	204.5173	309.5186 (98a)
Space heating requirement - total per year (kWh/year)												1482.4231
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	303.4625	231.2184	192.4995	102.3275	40.6742	0.0000	0.0000	0.0000	0.0000	98.2051	204.5173	309.5186 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1482.4231
Space heating per m2										(98c) / (4) =		29.8274 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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	0.0000	0.0000	0.0000	0.0000	0.0000	463.5865	364.9511	373.9309	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8828	0.9353	0.9152	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	409.2556	341.3432	342.2170	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	540.2952	517.8203	486.4126	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	94.3485	131.2990	107.2815	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	23.5871	32.8247	26.8204	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												83.2322 (107)
Energy for space heating												29.8274 (99)
Energy for space cooling												1.6747 (108)
Total												31.5021 (109)
Fabric Energy Efficiency (TFEE)												31.5 (109)

Full SAP Calculation Printout



Property Reference	P1 Ladds			Issued on Date	21/08/2025
Assessment Reference	Grd Flr Flat	Prop Type Ref	Semi		
Property	1, Bath Road, Hare Hatch, Berkshire, RG10 9SA				
SAP Rating	67 D	DER	9.55	TER	12.80
Environmental	94 A	% DER < TER			25.39
CO ₂ Emissions (t/year)	0.43	DFEE	32.19	TFEE	31.50
Compliance Check	See BREL	% DFEE < TFEE			-2.19
% DPER < TPER	-49.11	DPER	100.17	TPER	67.18
Assessor Details	Mrs. Rebecca Lennon			Assessor ID	P627-0001
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	49.7000 (1b)	2.4000 (2b)	119.2800 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.7000		119.2800 (4)
Dwelling volume			119.2800 (5)

2. Ventilation rate

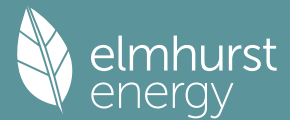
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	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) = 0.1677 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3677 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3125 (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	0.3985	0.3907	0.3828	0.3438	0.3360	0.2969	0.2969	0.2891	0.3125	0.3360	0.3516	0.3672 (22b)
Effective ac	0.5794	0.5763	0.5733	0.5591	0.5564	0.5441	0.5441	0.5418	0.5488	0.5564	0.5618	0.5674 (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							
Ent Door			1.9600	1.2000	2.3520		(26a)
Windows			7.8300	1.1450	8.9656		(27)
Heatloss Floor 1			49.7000	0.1200	5.9640	75.0000	3727.5000 (28a)
External Wall 1	35.7600	9.7900	25.9700	0.2000	5.1940	60.0000	1558.2000 (29a)
Total net area of external elements Aum(A, m ²)			85.4600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.4756		(33)
Main dwelling							
Party Wall 1			36.9600	0.0000	0.0000	70.0000	2587.2000 (32)
Party Ceiling 1			49.7000			20.0000	994.0000 (32b)
Internal Wall 1			69.1200			9.0000	622.0800 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9488.9800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							190.9252 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				5.7300	0.0480	0.2750	
E3 Sill				4.8000	0.0450	0.2160	
E4 Jamb				13.8000	0.0510	0.7038	
E5 Ground floor (normal)				14.9000	0.0640	0.9536	
E16 Corner (normal)				2.4000	0.0570	0.1368	

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E18 Party wall between dwellings	4.8000	0.0620	0.2976	
P1 Party wall - Ground floor	15.4000	0.3200	4.9280	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				7.5108 (36)
Point Thermal bridges				0.0000
Total fabric heat loss		(33) + (36) + (36a) =		29.9865 (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	22.8061	22.6847	22.5658	22.0071	21.9026	21.4160	21.4160	21.3259	21.6035	21.9026	22.1141	22.3351 (38)
Average = Sum(39)m / 12 =	52.7926	52.6712	52.5523	51.9936	51.8891	51.4025	51.4025	51.3124	51.5899	51.8891	52.1005	52.3216 (39)
												51.9931
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0622	1.0598	1.0574	1.0461	1.0440	1.0343	1.0343	1.0324	1.0380	1.0440	1.0483	1.0527 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

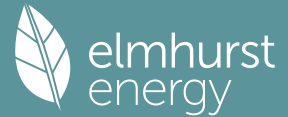
4. Water heating energy requirements (kWh/year)												
Assumed occupancy												1.6813 (42)
Hot water usage for mixer showers												
Hot water usage for baths	51.0848	50.3027	49.1501	47.3770	45.7883	43.5658	41.8079	43.8630	44.8966	47.0979	49.3904	51.0387 (42a)
Hot water usage for other uses	22.1556	21.8212	21.3454	20.6328	19.9907	19.1067	18.4360	19.2561	19.6865	20.5624	21.4731	22.1380 (42b)
Average daily hot water use (litres/day)	31.8479	30.6898	29.5317	28.3736	27.2155	26.0574	26.0574	27.2155	28.3736	29.5317	30.6898	31.8479 (42c)
												96.5923 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	105.0883	102.8136	100.0271	96.3834	92.9945	88.7298	86.3013	90.3346	92.9567	97.1920	101.5532	105.0246 (44)
Energy content (annual)	154.7081	136.0432	142.9367	125.9008	119.8328	102.6131	95.3655	106.3254	107.8251	125.2417	137.2526	154.2364 (45)
Distribution loss (46)m = 0.15 x (45)m	23.2062	20.4065	21.4405	18.8851	17.9749	15.3920	14.3048	15.9488	16.1738	18.7863	20.5879	23.1355 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.9400 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.5076 (55)
Total storage loss	15.7356	14.2128	15.7356	15.2280	15.7356	15.2280	15.7356	15.7356	15.2280	15.7356	15.2280	15.7356 (56)
If cylinder contains dedicated solar storage	15.7356	14.2128	15.7356	15.2280	15.7356	15.2280	15.7356	15.7356	15.2280	15.7356	15.2280	15.7356 (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	193.7061	171.2672	181.9347	163.6408	158.8308	140.3531	134.3635	145.3234	145.5651	164.2397	174.9926	193.2344 (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	193.7061	171.2672	181.9347	163.6408	158.8308	140.3531	134.3635	145.3234	145.5651	164.2397	174.9926	193.2344 (64)
12Total per year (kWh/year)												1967.4514 (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	82.6388	73.4136	78.7249	72.0540	71.0428	64.3109	62.9074	66.5516	66.0438	72.8413	75.8285	82.4820 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.3042	85.5868	77.3042	79.8810	77.3042	79.8810	77.3042	77.3042	79.8810	77.3042	79.8810	77.3042 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	146.4548	147.9745	144.1448	135.9919	125.7002	116.0275	109.5655	108.0457	111.8754	120.0284	130.3201	139.9928 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064 (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)	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509 (71)
Water heating gains (Table 5)	111.0737	109.2464	105.8130	100.0750	95.4876	89.3206	84.5530	89.4511	91.7276	97.9049	105.3173	110.8629 (72)
Total internal gains	383.0518	391.0268	375.4811	364.1670	346.7111	333.4482	319.6418	323.0201	331.7031	343.4566	363.7375	376.3790 (73)

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	5.4000											22.5490 (74)
South	2.4300											44.6137 (78)
Solar gains	67.1626	116.1579	166.2969	222.8092	268.0576	275.1069	261.4292	225.7334	185.2647	130.1039	80.6995	57.3482 (83)
Total gains	450.2144	507.1847	541.7780	586.9762	614.7687	608.5550	581.0710	548.7535	516.9678	473.5605	444.4370	433.7273 (84)

7. Mean internal temperature (heating season)												
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)

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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	49.9280	50.0430	50.1563	50.6952	50.7973	51.2782	51.2782	51.3682	51.0919	50.7973	50.5912	50.3774
alpha	4.3285	4.3362	4.3438	4.3797	4.3865	4.4185	4.4185	4.4245	4.4061	4.3865	4.3727	4.3585
util living area	0.9726	0.9538	0.9217	0.8412	0.7049	0.5236	0.3855	0.4242	0.6408	0.8633	0.9507	0.9761 (86)
Living	20.0281	20.1891	20.3952	20.6537	20.8292	20.9089	20.9256	20.9235	20.8794	20.6630	20.3152	20.0025
Non living	18.9105	19.1127	19.3679	19.6808	19.8715	19.9520	19.9634	19.9639	19.9267	19.7001	19.2804	18.8847
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	31	28	31	30	31	30	31	31	30	31	30	31
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000 (87)
Th 2	20.0318	20.0338	20.0358	20.0451	20.0468	20.0549	20.0549	20.0564	20.0518	20.0468	20.0433	20.0396 (88)
util rest of house	0.9664	0.9438	0.9047	0.8088	0.6517	0.4525	0.3045	0.3399	0.5681	0.8281	0.9384	0.9707 (89)
MIT 2	20.0318	20.0338	20.0358	20.0451	20.0468	20.0549	20.0549	20.0564	20.0518	20.0468	20.0433	20.0396 (90)
Living area fraction									FLA = Living area / (4) =			
MIT	20.4760	20.4771	20.4781	20.4831	20.4841	20.4885	20.4885	20.4893	20.4868	20.4841	20.4822	20.4802 (91)
Temperature adjustment												0.0000
adjusted MIT	20.4760	20.4771	20.4781	20.4831	20.4841	20.4885	20.4885	20.4893	20.4868	20.4841	20.4822	20.4802 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9694	0.9486	0.9129	0.8244	0.6769	0.4857	0.3420	0.3790	0.6025	0.8453	0.9444	0.9734 (94)
Useful gains	436.4349	481.1270	494.6144	483.9136	416.1634	295.5694	198.6985	207.9783	311.4952	400.2977	419.7464	422.1825 (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	853.9707	820.4624	734.5821	602.2493	455.7979	302.6817	199.8766	209.8304	329.4931	512.8759	697.2187	851.8058 (97)
Space heating kWh	310.6467	228.0334	178.5360	85.2017	29.4881	0.0000	0.0000	0.0000	0.0000	83.7582	199.7801	319.6397 (98a)
Space heating requirement - total per year (kWh/year)												1435.0837
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	310.6467	228.0334	178.5360	85.2017	29.4881	0.0000	0.0000	0.0000	0.0000	83.7582	199.7801	319.6397 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1435.0837
Space heating per m2										(98c) / (4) =		28.8749 (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 %)												130.2138 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	310.6467	228.0334	178.5360	85.2017	29.4881	0.0000	0.0000	0.0000	0.0000	83.7582	199.7801	319.6397 (98)
Space heating efficiency (main heating system 1)	130.2138	130.2138	130.2138	130.2138	130.2138	0.0000	0.0000	0.0000	0.0000	130.2138	130.2138	130.2138 (210)
Space heating fuel (main heating system)	238.5665	175.1222	137.1098	65.4321	22.6459	0.0000	0.0000	0.0000	0.0000	64.3235	153.4246	245.4729 (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	193.7061	171.2672	181.9347	163.6408	158.8308	140.3531	134.3635	145.3234	145.5651	164.2397	174.9926	193.2344 (64)
Efficiency of water heater	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month	193.7061	171.2672	181.9347	163.6408	158.8308	140.3531	134.3635	145.3234	145.5651	164.2397	174.9926	193.2344 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	18.9190	15.1775	13.6657	10.0121	7.7336	6.3184	7.0549	9.1702	11.9111	15.6281	17.6519	19.4448 (232)
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 (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												1102.0977 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												100.0000
Water heating fuel used												1967.4514 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												152.6873 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)

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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	3222.2364 (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 (high-rate cost)	881.6782	0.1639	144.5162 (261)
Space heating - main system 1 (low-rate cost)	220.4195	0.1376	30.3322 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating - high rate cost	1377.2160	0.1478	203.6134 (264)
Water heating - low rate cost	590.2354	0.1241	73.2386 (264)
Space and water heating			451.7004 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	152.6873	0.1490	22.7534 (268)
Total CO2, kg/year			474.4538 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			9.5500 (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 (high-rate cost)	881.6782	1.2888	1420.3493 (275)
Space heating - main system 1 (low-rate cost)	220.4195	1.4983	330.2445 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating - high rate cost	1377.2160	1.5527	2138.3451 (278)
Water heating - low rate cost	590.2354	1.4440	852.3137 (278)
Space and water heating			4741.2525 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	152.6873	1.5547	237.3898 (282)
Total Primary energy kWh/year			4978.6423 (286)
Dwelling Primary energy Rate (DPER)			100.1700 (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	49.7000 (1b)	x 2.4000 (2b)	= 119.2800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 119.2800 (5)

2. Ventilation rate

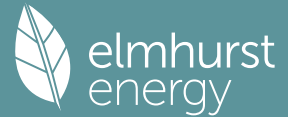
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.1677 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4177 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3550 (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	0.4527	0.4438	0.4349	0.3905	0.3816	0.3373	0.3373	0.3284	0.3550	0.3816	0.3994	0.4172 (22b)
Effective ac	0.6024	0.5985	0.5946	0.5763	0.5728	0.5569	0.5569	0.5539	0.5630	0.5728	0.5798	0.5870 (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 Semi-glazed door			1.9600	1.0000	1.9600		(26a)

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TER Opening Type				7.8300	1.1450	8.9656	(27)
Heatloss Floor 1				49.7000	0.1300	6.4610	(28a)
External Wall 1	35.7600	9.7900		25.9700	0.1800	4.6746	(29a)
Total net area of external elements Aum(A, m2)				85.4600			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =		22.0612	(33)
Main dwelling							
Party Wall 1			36.9600	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 200.9252 (35)

List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				5.7300	0.0500	0.2865	
E3 Sill				4.8000	0.0500	0.2400	
E4 Jamb				13.8000	0.0500	0.6900	
E5 Ground floor (normal)				14.9000	0.1600	2.3840	
E16 Corner (normal)				2.4000	0.0900	0.2160	
E18 Party wall between dwellings				4.8000	0.0600	0.2880	
P1 Party wall - Ground floor				15.4000	0.0800	1.2320	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.3365 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 27.3977 (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	23.7138	23.5572	23.4037	22.6828	22.5479	21.9200	21.9200	21.8037	22.1618	22.5479	22.8207	23.1060
Heat transfer coeff	51.1115	50.9549	50.8014	50.0805	49.9456	49.3177	49.3177	49.2014	49.5596	49.9456	50.2185	50.5038
Average = Sum(39)m / 12 =												50.0799

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0284	1.0253	1.0222	1.0077	1.0049	0.9923	0.9923	0.9900	0.9972	1.0049	1.0104	1.0162
HLP (average)												1.0076
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6813 (42)
Hot water usage for mixer showers													
52.4089	51.6213	50.4736	48.2777	46.6572	44.8500	43.8228	44.9618	46.2103	48.1507	50.3938	52.2081	(42a)	
Hot water usage for baths													
22.6608	22.3242	21.8503	20.9765	20.3221	19.5966	19.2047	19.6753	20.1877	20.9641	21.8559	22.5842	(42b)	
Hot water usage for other uses													
31.8479	30.6898	29.5317	28.3736	27.2155	26.0574	26.0574	27.2155	28.3736	29.5317	30.6898	31.8479	(42c)	
Average daily hot water use (litres/day)												98.2820	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	106.9176	104.6353	101.8556	97.6277	94.1948	90.5040	89.0849	91.8526	94.7717	98.6465	102.9395	106.6401
Energy conte	169.3313	148.9993	156.5482	133.6475	126.8043	111.2852	107.7404	113.7327	116.8629	133.8623	146.6562	166.9727
Energy content (annual)												1632.4430
Distribution loss (46)m = 0.15 x (45)m												
25.3997	22.3499	23.4822	20.0471	19.0206	16.6928	16.1611	17.0599	17.5294	20.0794	21.9984	25.0459	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	215.9262	191.0850	203.1431	178.7393	173.3992	156.3770	154.3353	160.3276	161.9548	180.4572	191.7480	213.5676	(62)
WWHRS	-23.9592	-21.1897	-22.1886	-18.3730	-17.1230	-14.6523	-13.7342	-14.6049	-15.1598	-17.8718	-20.2465	-23.5155	(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	191.9670	169.8953	180.9545	160.3663	156.2762	141.7247	140.6011	145.7227	146.7950	162.5855	171.5015	190.0521	(64)

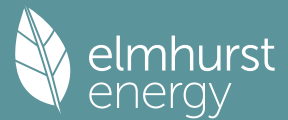
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.3042	85.5868	77.3042	79.8810	77.3042	79.8810	77.3042	77.3042	79.8810	77.3042	79.8810	77.3042 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	146.4548	147.9745	144.1448	135.9919	125.7002	116.0275	109.5655	108.0457	111.8754	120.0284	130.3201	139.9928 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064 (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)	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509 (71)
Water heating gains (Table 5)	125.7776	123.8256	120.0648	111.8212	106.7720	101.4942	98.2522	100.9302	104.0700	109.9263	117.8287	124.7236 (72)
Total internal gains	400.7557	408.6061	392.7329	378.9131	360.9954	345.6217	333.3409	334.4992	344.0455	358.4780	379.2489	393.2397 (73)

6. Solar gains

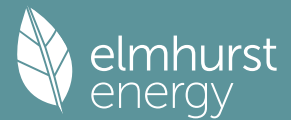
[Jan]	Area	Solar flux	g	FF	Access	Gains
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	m2				Table 6a W/m2	Specific data or Table 6b		Specific data or Table 6c	factor Table 6d		W	
North	5.4000				10.6334	0.6300		0.7000	0.7700		17.5484 (74)	
South	2.4300				46.7521	0.6300		0.7000	0.7700		34.7199 (78)	
Solar gains	52.2683	90.3982	129.4181	173.3980	208.6119	214.0979	203.4535	175.6737	144.1795	101.2514	62.8032	44.6304 (83)
Total gains	453.0241	499.0042	522.1511	552.3112	569.6074	559.7196	536.7944	510.1729	488.2250	459.7294	442.0520	437.8701 (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	54.2712	54.4380	54.6025	55.3885	55.5381	56.2452	56.2452	56.3781	55.9707	55.5381	55.2363	54.9243
alpha	4.6181	4.6292	4.6402	4.6926	4.7025	4.7497	4.7497	4.7585	4.7314	4.7025	4.6824	4.6616
util living area	0.9741	0.9582	0.9311	0.8603	0.7316	0.5471	0.4010	0.4384	0.6557	0.8709	0.9533	0.9773 (86)
MIT	19.9191	20.1022	20.3425	20.6554	20.8741	20.9751	20.9953	20.9930	20.9423	20.6863	20.2719	19.8945 (87)
Th 2	20.0597	20.0623	20.0649	20.0770	20.0792	20.0897	20.0897	20.0917	20.0857	20.0792	20.0746	20.0699 (88)
util rest of house	0.9681	0.9488	0.9155	0.8298	0.6795	0.4757	0.3196	0.3543	0.5837	0.8365	0.9412	0.9720 (89)
MIT 2	18.8252	19.0553	19.3537	19.7341	19.9728	20.0745	20.0880	20.0888	20.0461	19.7787	19.2792	18.8019 (90)
Living area fraction	19.3270	19.5355	19.8073	20.1567	20.3863	20.4876	20.5042	20.5036	20.4572	20.1951	19.7346	19.3031 (92)
MIT	19.3270	19.5355	19.8073	20.1567	20.3863	20.4876	20.5042	20.5036	20.4572	20.1951	19.7346	19.3031 (93)
Temperature adjustment												0.0000
adjusted MIT	19.3270	19.5355	19.8073	20.1567	20.3863	20.4876	20.5042	20.5036	20.4572	20.1951	19.7346	19.3031 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9622	0.9425	0.9105	0.8327	0.6976	0.5075	0.3569	0.3928	0.6140	0.8413	0.9359	0.9665 (94)
Useful gains	435.9136	470.3105	475.4074	459.8922	397.3820	284.0322	191.5971	200.4135	299.7510	386.7790	413.7352	423.2076 (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	768.0548	745.7533	676.0310	563.7432	433.8404	290.3652	192.5475	201.9021	315.0621	479.2308	634.4910	762.7635 (97)
Space heating kWh	247.1130	185.0976	149.2639	74.7728	27.1250	0.0000	0.0000	0.0000	0.0000	68.7841	158.9442	252.6296 (98a)
Space heating requirement - total per year (kWh/year)												1163.7302
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	247.1130	185.0976	149.2639	74.7728	27.1250	0.0000	0.0000	0.0000	0.0000	68.7841	158.9442	252.6296 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1163.7302
Space heating per m2										(98c) / (4) =		23.4151 (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	247.1130	185.0976	149.2639	74.7728	27.1250	0.0000	0.0000	0.0000	0.0000	68.7841	158.9442	252.6296 (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)	267.7281	200.5391	161.7160	81.0106	29.3879	0.0000	0.0000	0.0000	0.0000	74.5223	172.2039	273.7049 (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	191.9670	169.8953	180.9545	160.3663	156.2762	141.7247	140.6011	145.7227	146.7950	162.5855	171.5015	190.0521 (64)
Efficiency of water heater (217)m	84.6272	84.2524	83.6314	82.4575	81.0144	79.8000	79.8000	79.8000	79.8000	82.2791	83.8896	79.8000 (216)
Fuel for water heating, kWh/month	226.8386	201.6505	216.3716	194.4835	192.8993	177.5999	176.1919	182.6099	183.9536	197.6023	204.4371	84.6989 (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	16.0623	12.8858	11.6022	8.5003	6.5659	5.3644	5.9896	7.7855	10.1126	13.2683	14.9865	16.5087 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-23.7136	-33.6724	-48.7652	-55.2905	-60.0607	-56.2761	-55.6371	-52.3390	-46.5376	-38.7698	-26.1773	-20.4783 (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)	-12.6717	-26.7391	-53.2786	-80.1924	-106.1695	-106.6736	-105.3632	-89.1018	-65.2025	-38.2323	-16.9215	-10.0097 (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												1260.8127 (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	79.8000	
Water heating fuel used	2379.0237	(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)	129.6319	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1228.2735	(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	2627.1947	(238)

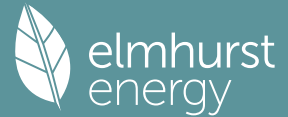
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1260.8127	0.2100	264.7707 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2379.0237	0.2100	499.5950 (264)
Space and water heating			764.3656 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	129.6319	0.1443	18.7099 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-517.7176	0.1344	-69.5804
PV Unit electricity exported	-710.5559	0.1258	-89.4204
Total			-159.0008 (269)
Total CO2, kg/year			636.0040 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.8000 (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	1260.8127	1.1300	1424.7184 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2379.0237	1.1300	2688.2967 (278)
Space and water heating			4113.0151 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	129.6319	1.5338	198.8337 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-517.7176	1.4967	-774.8692
PV Unit electricity exported	-710.5559	0.4619	-328.2336
Total			-1103.1028 (283)
Total Primary energy kWh/year			3338.8468 (286)
Target Primary Energy Rate (TPER)			67.1800 (287)

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Property Reference	P3 Ladds				Issued on Date	21/08/2025
Assessment Reference	1st Flr Flat	Prop Type Ref		Semi		
Property	1, Bath Road, Hare Hatch, Berkshire, RG10 9SA					
SAP Rating	69 C	DER	7.86	TER	11.57	
Environmental	94 A	% DER < TER				32.07
CO ₂ Emissions (t/year)	0.47	DFEE	33.87	TFEE	31.61	
Compliance Check	See BREL	% DFEE < TFEE				-7.14
% DPER < TPER	-36.70	DPER	82.77	TPER	60.55	
Assessor Details	Mrs. Rebecca Lennon				Assessor ID	P627-0001
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	6.0000 (1b)	x 2.4000 (2b)	= 14.4000 (1b) - (3b)
First floor	57.7000 (1c)	x 2.4000 (2c)	= 138.4800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 152.8800 (5)

2. Ventilation rate

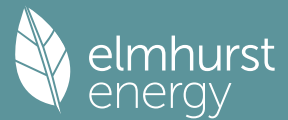
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	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) = 0.1308 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3308 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2812 (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	0.3585	0.3515	0.3445	0.3093	0.3023	0.2671	0.2671	0.2601	0.2812	0.3023	0.3163	0.3304 (22b)
Effective ac	0.5643	0.5618	0.5593	0.5478	0.5457	0.5357	0.5357	0.5338	0.5395	0.5457	0.5500	0.5546 (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							
Ent Door			1.9600	1.2000	2.3520		(26a)
Windows			8.1000	1.1450	9.2748		(27)
Heatloss Floor 1			6.0000	0.1200	0.7200	75.0000	450.0000 (28a)
External Wall 1	66.7200	10.0600	56.6600	0.2000	11.3320	60.0000	3399.6000 (29a)
Planned Roof	57.7000		57.7000	0.0900	5.1930	9.0000	519.3000 (30)
Total net area of external elements Aum(A, m ²)			130.4200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.8718		(33)
Main dwelling							
Party Wall 1			36.9600	0.0000	0.0000	70.0000	2587.2000 (32)
Party Floor 1			49.7000			30.0000	1491.0000 (32d)
Internal Wall 1			113.7600			9.0000	1023.8400 (32c)
Internal Floor 1			6.0000			18.0000	108.0000 (32d)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9578.9400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							150.3758 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E16 Corner (normal)				7.2000	0.0570	0.4104	
P1 Party wall - Ground floor				6.0000	0.3200	1.9200	

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E2 Other lintels (including other steel lintels)	6.9300	0.0480	0.3326
E3 Sill	6.0000	0.0450	0.2700
E4 Jamb	15.0000	0.0510	0.7650
E6 Intermediate floor within a dwelling	6.1000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	21.7000	0.0640	1.3888
E18 Party wall between dwellings	9.6000	0.0620	0.5952
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.4000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	9.4000	0.4800	4.5120
E10 Eaves (insulation at ceiling level)	21.7000	0.0840	1.8228
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			12.0168 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	40.8886 (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	28.4677	28.3418	28.2184	27.6387	27.5302	27.0253	27.0253	26.9318	27.2198	27.5302	27.7496	27.9790 (38)
Average = Sum(39)m / 12 =	69.3564	69.2304	69.1070	68.5273	68.4189	67.9140	67.9140	67.8205	68.1085	68.4189	68.6383	68.8677 (39)
												68.5268
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0888	1.0868	1.0849	1.0758	1.0741	1.0662	1.0662	1.0647	1.0692	1.0741	1.0775	1.0811 (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												2.0841 (42)
Hot water usage for mixer showers												
Hot water usage for baths	57.6681	56.7852	55.4841	53.4825	51.6891	49.1801	47.1957	49.5156	50.6824	53.1674	55.7553	57.6161 (42a)
Hot water usage for other uses	24.9953	24.6180	24.0812	23.2773	22.5529	21.5556	20.7990	21.7242	22.2097	23.1979	24.2253	24.9754 (42b)
Average daily hot water use (litres/day)	35.9731	34.6650	33.3569	32.0488	30.7407	29.4325	29.4325	30.7407	32.0488	33.3569	34.6650	35.9731 (42c)
												109.0449 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	118.6365	116.0682	112.9221	108.8086	104.9826	100.1683	97.4272	101.9804	104.9409	109.7222	114.6456	118.5647 (44)
Energy content (annual)	174.6534	153.5817	161.3634	142.1312	135.2807	115.8412	107.6600	120.0329	121.7262	141.3882	154.9474	174.1209 (45)
Distribution loss (46)m = 0.15 x (45)m	26.1980	23.0373	24.2045	21.3197	20.2921	17.3762	16.1490	18.0049	18.2589	21.2082	23.2421	26.1181 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.9400 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.5076 (55)
Total storage loss	15.7356	14.2128	15.7356	15.2280	15.7356	15.2280	15.7356	15.7356	15.2280	15.7356	15.2280	15.7356 (56)
If cylinder contains dedicated solar storage	15.7356	14.2128	15.7356	15.2280	15.7356	15.2280	15.7356	15.7356	15.2280	15.7356	15.2280	15.7356 (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	213.6514	188.8057	200.3614	179.8712	174.2787	153.5812	146.6580	159.0309	159.4662	180.3862	192.6874	213.1189 (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	213.6514	188.8057	200.3614	179.8712	174.2787	153.5812	146.6580	159.0309	159.4662	180.3862	192.6874	213.1189 (64)
												2161.8971 (64)
12Total per year (kWh/year)												2162 (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	89.2707	79.2451	84.8517	77.4506	76.1792	68.7092	66.9953	71.1093	70.6660	78.2100	81.7120	89.0936 (65)

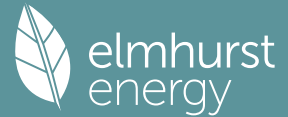
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	100.6872	111.4751	100.6872	104.0435	100.6872	104.0435	100.6872	100.6872	104.0435	100.6872	104.0435	100.6872 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	182.1728	184.0632	179.2995	169.1581	156.3565	144.3247	136.2868	134.3964	139.1601	149.3014	162.1031	174.1348 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204 (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)	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634 (71)
Water heating gains (Table 5)	119.9875	117.9243	114.0480	107.5703	102.3914	95.4295	90.0475	95.5770	98.1472	105.1209	113.4889	119.7495 (72)
Total internal gains	457.1087	467.7239	448.2960	435.0331	413.6964	398.0589	381.2828	384.9219	395.6120	409.3709	433.8967	448.8328 (73)

6. Solar gains

[Jan]												Gains
				Area	Solar flux		g		FF	Access		
				m2	Table 6a		Specific data		Specific data	factor		W
					W/m2		or Table 6b		or Table 6c	Table 6d		
North				4.0500	10.6334		0.5100		0.0000	0.7700		16.9117 (74)
South				4.0500	46.7521		0.5100		0.0000	0.7700		74.3561 (78)
Solar gains	91.2678	154.0953	210.0394	263.5333	301.5255	303.0306	290.5542	261.0554	228.0719	169.8188	109.0001	78.3490 (83)
Total gains	548.3766	621.8192	658.3354	698.5665	715.2219	701.0895	671.8369	645.9773	623.6839	579.1896	542.8969	527.1818 (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	38.3644	38.4342	38.5028	38.8285	38.8901	39.1792	39.1792	39.2332	39.0673	38.8901	38.7658	38.6367
alpha	3.5576	3.5623	3.5669	3.5886	3.5927	3.6119	3.6119	3.6155	3.6045	3.5927	3.5844	3.5758
util living area	0.9619	0.9406	0.9101	0.8436	0.7344	0.5729	0.4312	0.4643	0.6616	0.8548	0.9382	0.9663 (86)
Living	19.7319	19.9207	20.1582	20.4633	20.7054	20.8524	20.8975	20.8921	20.8065	20.5071	20.0785	19.6984
Non living	18.5385	18.7753	19.0710	19.4451	19.7218	19.8753	19.9110	19.9090	19.8335	19.5054	18.9822	18.5013
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	31	28	31	30	31	30	31	31	30	31	30	31
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000 (87)
Th 2	20.0100	20.0116	20.0132	20.0207	20.0221	20.0286	20.0286	20.0298	20.0261	20.0221	20.0192	20.0163 (88)
util rest of house	0.9548	0.9299	0.8937	0.8147	0.6859	0.5001	0.3416	0.3738	0.5922	0.8221	0.9253	0.9600 (89)
MIT 2	20.0100	20.0116	20.0132	20.0207	20.0221	20.0286	20.0286	20.0298	20.0261	20.0221	20.0192	20.0163 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	20.3255	20.3266	20.3277	20.3328	20.3337	20.3381	20.3381	20.3390	20.3364	20.3337	20.3318	20.3298 (92)
Temperature adjustment												0.0000
adjusted MIT	20.3255	20.3266	20.3277	20.3328	20.3337	20.3381	20.3381	20.3390	20.3364	20.3337	20.3318	20.3298 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9573	0.9335	0.8993	0.8245	0.7022	0.5241	0.3708	0.4034	0.6155	0.8333	0.9298	0.9622 (94)
Useful gains	524.9383	580.4875	592.0302	575.9918	502.2221	367.4667	249.1211	260.5973	383.8511	482.6345	504.7619	507.2463 (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	1111.4695	1067.9898	955.5894	783.4564	590.7087	389.7004	253.8725	267.1428	424.7541	665.9695	908.2070	1110.8198 (97)
Space heating kWh	436.3792	327.6016	270.4881	149.3745	65.8341	0.0000	0.0000	0.0000	0.0000	136.4012	290.4805	449.0587 (98a)
Space heating requirement - total per year (kWh/year)												2125.6179
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	436.3792	327.6016	270.4881	149.3745	65.8341	0.0000	0.0000	0.0000	0.0000	136.4012	290.4805	449.0587 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2125.6179
Space heating per m2										(98c) / (4) =		33.3692 (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 %)												201.0448 (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	436.3792	327.6016	270.4881	149.3745	65.8341	0.0000	0.0000	0.0000	0.0000	136.4012	290.4805	449.0587 (98)
Space heating efficiency (main heating system 1)	201.0448	201.0448	201.0448	201.0448	201.0448	0.0000	0.0000	0.0000	0.0000	201.0448	201.0448	201.0448 (210)
Space heating fuel (main heating system)	217.0557	162.9495	134.5412	74.2991	32.7460	0.0000	0.0000	0.0000	0.0000	67.8462	144.4854	223.3625 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	213.6514	188.8057	200.3614	179.8712	174.2787	153.5812	146.6580	159.0309	159.4662	180.3862	192.6874	213.1189 (64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month	213.6514	188.8057	200.3614	179.8712	174.2787	153.5812	146.6580	159.0309	159.4662	180.3862	192.6874	213.1189 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	24.6261	19.7560	17.7881	13.0323	10.0665	8.2244	9.1830	11.9364	15.5043	20.3424	22.9767	25.3105 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1057.2856 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												100.0000
Water heating fuel used												2161.8971 (219)
Space cooling fuel												0.0000 (221)

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Electricity for pumps and fans:
 Total electricity for the above, kWh/year 0.0000 (231)
 Electricity for lighting (calculated in Appendix L) 198.7468 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
 PV generation 0.0000 (233)
 Wind generation 0.0000 (234)
 Hydro-electric generation (Appendix N) 0.0000 (235a)
 Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
 Appendix Q - special features
 Energy saved or generated -0.0000 (236)
 Energy used 0.0000 (237)
 Total delivered energy for all uses 3417.9295 (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 (high-rate cost)	845.8285	0.1632	138.0341 (261)
Space heating - main system 1 (low-rate cost)	211.4571	0.1370	28.9721 (261)
Total CO2 associated with community systems			0.0000 (261)
Water heating - high rate cost	1513.3280	0.1479	223.8321 (264)
Water heating - low rate cost	648.5691	0.1241	80.5113 (264)
Space and water heating			471.3496 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	198.7468	0.1490	29.6172 (268)
Total CO2, kg/year			500.9669 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			7.8600 (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 (high-rate cost)	845.8285	1.2867	1360.4289 (275)
Space heating - main system 1 (low-rate cost)	211.4571	1.4959	316.3121 (275)
Total CO2 associated with community systems			0.0000 (275)
Water heating - high rate cost	1513.3280	1.5529	2350.0272 (278)
Water heating - low rate cost	648.5691	1.4442	936.6872 (278)
Space and water heating			4963.4554 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	198.7468	1.5547	309.0005 (282)
Total Primary energy kWh/year			5272.4559 (286)
Dwelling Primary energy Rate (DPER)			82.7700 (287)

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

1. Overall dwelling characteristics

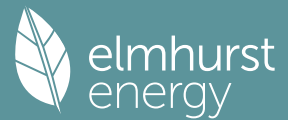
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	6.0000 (1b)	x 2.4000 (2b)	= 14.4000 (1b) - (3b)
First floor	57.7000 (1c)	x 2.4000 (2c)	= 138.4800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 152.8800 (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) = 0.1308 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3808	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3237 (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	0.4127	0.4046	0.3965	0.3561	0.3480	0.3075	0.3075	0.2994	0.3237	0.3480	0.3642	0.3803 (22b)
Effective ac	0.5852	0.5819	0.5786	0.5634	0.5605	0.5473	0.5473	0.5448	0.5524	0.5605	0.5663	0.5723 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Semi-glazed door			1.9600	1.0000	1.9600			(26a)
TER Opening Type			8.1000	1.1450	9.2748			(27)
Heatloss Floor 1			6.0000	0.1300	0.7800			(28a)
External Wall 1	66.7200	10.0600	56.6600	0.1800	10.1988			(29a)
Planned Roof	57.7000		57.7000	0.1100	6.3470			(30)
Total net area of external elements Aum(A, m2)			130.4200					(31)
Fabric heat loss, W/K = Sum (A x U)					28.5606			(33)
Main dwelling								
Party Wall 1			36.9600	0.0000	0.0000			(32)

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

150.3758 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E16 Corner (normal)	7.2000	0.0900	0.6480	
P1 Party wall - Ground floor	6.0000	0.0800	0.4800	
E2 Other lintels (including other steel lintels)	6.9300	0.0500	0.3465	
E3 Sill	6.0000	0.0500	0.3000	
E4 Jamb	15.0000	0.0500	0.7500	
E6 Intermediate floor within a dwelling	6.1000	0.0000	0.0000	
E7 Party floor between dwellings (in blocks of flats)	21.7000	0.0700	1.5190	
E18 Party wall between dwellings	9.6000	0.0600	0.5760	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.4000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	9.4000	0.1200	1.1280	
E10 Eaves (insulation at ceiling level)	21.7000	0.0600	1.3020	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				7.0495 (36)
Point Thermal bridges				0.0000
Total fabric heat loss				(33) + (36) + (36a) = 35.6101 (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	29.5219	29.3551	29.1915	28.4234	28.2796	27.6106	27.6106	27.4867	27.8683	28.2796	28.5704	28.8743	(38)
Average = Sum(39)m / 12 =	65.1320	64.9652	64.8016	64.0335	63.8898	63.2207	63.2207	63.0968	63.4784	63.8898	64.1805	64.4845	(39)
												64.0328	
HLP	1.0225	1.0199	1.0173	1.0052	1.0030	0.9925	0.9925	0.9905	0.9965	1.0030	1.0075	1.0123	(40)
HLP (average)												1.0052	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

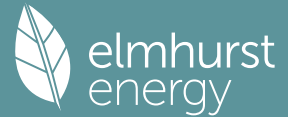
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.0841 (42)
Hot water usage for mixer showers													
59.1629	58.2737	56.9781	54.4993	52.6699	50.6298	49.4702	50.7560	52.1655	54.3559	56.8881	58.9362	58.9362	(42a)
Hot water usage for baths													
25.5652	25.1855	24.6508	23.6650	22.9268	22.1083	21.6662	22.1971	22.7752	23.6510	24.6572	25.4788	25.4788	(42b)
Hot water usage for other uses													
35.9731	34.6650	33.3569	32.0488	30.7407	29.4325	29.4325	30.7407	32.0488	33.3569	34.6650	35.9731	35.9731	(42c)
Average daily hot water use (litres/day)												110.9520	(43)
Daily hot water use													
120.7012	118.1243	114.9859	110.2130	106.3374	102.1707	100.5690	103.6938	106.9895	111.3639	116.2102	120.3880	120.3880	(44)
Energy conte	191.1611	168.2074	176.7290	150.8761	143.1506	125.6308	121.6294	128.3946	131.9287	151.1197	165.5628	188.4986	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
28.6742	25.2311	26.5094	22.6314	21.4726	18.8446	18.2444	19.2592	19.7893	22.6680	24.8344	28.2748	28.2748	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	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	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	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													
237.7560	210.2931	223.3239	195.9680	189.7455	170.7226	168.2243	174.9895	177.0205	197.7146	210.6546	235.0935	235.0935	(62)
WWHRS	-27.0468	-23.9204	-25.0481	-20.7408	-19.3297	-16.5405	-15.5041	-16.4871	-17.1135	-20.1749	-22.8557	-26.5459	(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													
210.7092	186.3727	198.2759	175.2272	170.4158	154.1821	152.7202	158.5024	159.9071	177.5397	187.7989	208.5476	208.5476	(64)
12Total per year (kWh/year)												2140.1988	(64)
Electric shower(s)												2140	(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)
												0.0000	(64a)
Heat gains from water heating, kWh/month													
100.8370	89.5975	96.0383	86.2398	84.8735	77.8457	77.7177	79.9671	79.9398	87.5232	91.1231	99.9517	99.9517	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
100.6872	111.4751	100.6872	104.0435	100.6872	104.0435	100.6872	100.6872	104.0435	100.6872	104.0435	100.6872	100.6872	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
182.1728	184.0632	179.2995	169.1581	156.3565	144.3247	136.2868	134.3964	139.1601	149.3014	162.1031	174.1348	174.1348	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	(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)													

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	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634 (71)
Water heating gains (Table 5)	135.5336	133.3296	129.0838	119.7775	114.0773	108.1190	104.4593	107.4827	111.0275	117.6387	126.5599	134.3437 (72)
Total internal gains	475.6549	486.1292	466.3317	450.2403	428.3822	410.7485	395.6946	396.8276	408.4923	424.8887	449.9677	466.4270 (73)

6. Solar gains

[Jan]	Area		Solar flux		Specific data		Specific data		Access		Gains	
	m2		Table 6a		or Table 6b		or Table 6c		factor		W	
			W/m2						Table 6d			
North	4.0500		10.6334		0.6300		0.7000		0.7700		13.1613 (74)	
South	4.0500		46.7521		0.6300		0.7000		0.7700		57.8666 (78)	
Solar gains	71.0279	119.9224	163.4601	205.0909	234.6578	235.8291	226.1195	203.1625	177.4936	132.1590	84.8278	60.9739 (83)
Total gains	546.6827	606.0517	629.7918	655.3313	663.0400	646.5776	621.8141	599.9901	585.9858	557.0476	534.7955	527.4010 (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	40.8527	40.9576	41.0610	41.5535	41.6470	42.0877	42.0877	42.1704	41.9169	41.6470	41.4583	41.2629	
alpha	3.7235	3.7305	3.7374	3.7702	3.7765	3.8058	3.8058	3.8114	3.7945	3.7765	3.7639	3.7509	
util living area	0.9601	0.9406	0.9130	0.8509	0.7453	0.5818	0.4355	0.4676	0.6643	0.8541	0.9360	0.9643 (86)	
MIT	19.5686	19.7889	20.0714	20.4451	20.7442	20.9271	20.9811	20.9751	20.8752	20.5176	20.0002	19.5343 (87)	
Th 2	20.0646	20.0668	20.0689	20.0790	20.0809	20.0896	20.0896	20.0912	20.0862	20.0809	20.0771	20.0731 (88)	
util rest of house	0.9529	0.9302	0.8974	0.8238	0.6992	0.5122	0.3503	0.3817	0.5981	0.8224	0.9231	0.9579 (89)	
MIT 2	18.4139	18.6902	19.0424	19.5019	19.8451	20.0374	20.0805	20.0784	19.9892	19.5966	18.9657	18.3768 (90)	
Living area fraction									fLA = Living area / (4) =				0.3187 (91)
MIT	18.7819	19.0403	19.3703	19.8025	20.1316	20.3210	20.3675	20.3641	20.2716	19.8901	19.2954	18.7457 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.7819	19.0403	19.3703	19.8025	20.1316	20.3210	20.3675	20.3641	20.2716	19.8901	19.2954	18.7457 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9403	0.9162	0.8835	0.8146	0.7019	0.5306	0.3769	0.4081	0.6123	0.8150	0.9098	0.9460 (94)
Useful gains	514.0448	555.2487	556.4138	533.8365	465.4060	343.0762	234.3344	244.8504	358.8003	453.9709	486.5412	498.9189 (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	943.2357	918.6276	834.0181	698.1257	538.6954	361.6835	238.1840	250.1244	391.7606	593.5410	782.7047	937.9695 (97)
Space heating kWh	319.3180	244.1907	206.5376	118.2883	54.5273	0.0000	0.0000	0.0000	0.0000	103.8402	213.2377	326.6537 (98a)
Space heating requirement - total per year (kWh/year)												1586.5934
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	319.3180	244.1907	206.5376	118.2883	54.5273	0.0000	0.0000	0.0000	0.0000	103.8402	213.2377	326.6537 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1586.5934
Space heating per m2										(98c) / (4) =		24.9073 (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	319.3180	244.1907	206.5376	118.2883	54.5273	0.0000	0.0000	0.0000	0.0000	103.8402	213.2377	326.6537 (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)	345.9567	264.5619	223.7677	128.1563	59.0762	0.0000	0.0000	0.0000	0.0000	112.5029	231.0268	353.9043 (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	210.7092	186.3727	198.2759	175.2272	170.4158	154.1821	152.7202	158.5024	159.9071	177.5397	187.7989	208.5476 (64)
Efficiency of water heater	84.9894	84.6667	84.1515	83.1982	81.8099	79.8000	79.8000	79.8000	79.8000	82.9007	84.3454	85.0618 (217)
Fuel for water heating, kWh/month	247.9241	220.1251	235.6178	210.6141	208.3070	193.2106	191.3787	198.6246	200.3848	214.1595	222.6546	245.1718 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	20.9208	16.7835	15.1116	11.0714	8.5519	6.9870	7.8013	10.1405	13.1715	17.2817	19.5196	21.5023 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-30.0933	-42.5709	-61.4019	-69.2951	-74.9596	-70.0805	-69.2524	-65.2902	-58.2892	-48.8425	-33.1510	-26.0035 (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)												

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(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	-16.5414	-34.8579	-69.3866	-104.3520	-138.0960	-138.7705	-137.1002	-115.9930	-84.9270	-49.8504	-22.0882	-13.0726	(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												1718.9528	(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												2588.1728	(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)												168.8430	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1574.2660	(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												2987.7025	(238)

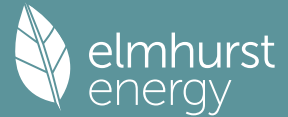
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1718.9528	0.2100	360.9801	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2588.1728	0.2100	543.5163	(264)
Space and water heating			904.4964	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	168.8430	0.1443	24.3693	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-649.2301	0.1345	-87.3223	
PV Unit electricity exported	-925.0360	0.1259	-116.4278	
Total			-203.7501	(269)
Total CO2, kg/year			737.0448	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.5700	(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	1718.9528	1.1300	1942.4167	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2588.1728	1.1300	2924.6353	(278)
Space and water heating			4867.0519	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	168.8430	1.5338	258.9770	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-649.2301	1.4971	-971.9555	
PV Unit electricity exported	-925.0360	0.4620	-427.3692	
Total			-1399.3246	(283)
Total Primary energy kWh/year			3856.8051	(286)
Target Primary Energy Rate (TPER)			60.5500	(287)

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Property Reference	P3 Ladds				Issued on Date	21/08/2025	
Assessment Reference	1st Flr Flat			Prop Type Ref	Semi		
Property	1, Bath Road, Hare Hatch, Berkshire, RG10 9SA						
SAP Rating	69 C		DER	7.86		TER	11.57
Environmental	94 A		% DER < TER				32.07
CO ₂ Emissions (t/year)	0.47		DFEE	33.87		TFEE	31.61
Compliance Check	See BREL		% DFEE < TFEE				-7.14
% DPER < TPER	-36.70		DPER	82.77		TPER	60.55
Assessor Details	Mrs. Rebecca Lennon					Assessor ID	P627-0001
Client							

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	6.0000 (1b)	x 2.4000 (2b)	= 14.4000 (1b) - (3b)
First floor	57.7000 (1c)	x 2.4000 (2c)	= 138.4800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 152.8800 (5)

2. Ventilation rate

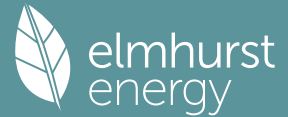
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	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) = 0.1308 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3308 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2812 (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	0.3585	0.3515	0.3445	0.3093	0.3023	0.2671	0.2671	0.2601	0.2812	0.3023	0.3163	0.3304 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5643	0.5618	0.5593	0.5478	0.5457	0.5357	0.5357	0.5338	0.5395	0.5457	0.5500	0.5546 (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							
Ent Door			1.9600	1.2000	2.3520		(26a)
Windows			8.1000	1.1450	9.2748		(27)
Heatloss Floor 1			6.0000	0.1200	0.7200	75.0000	450.0000 (28a)
External Wall 1	66.7200	10.0600	56.6600	0.2000	11.3320	60.0000	3399.6000 (29a)
Planned Roof	57.7000		57.7000	0.0900	5.1930	9.0000	519.3000 (30)
Total net area of external elements Aum(A, m ²)			130.4200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.8718		(33)
Main dwelling							
Party Wall 1			36.9600	0.0000	0.0000	70.0000	2587.2000 (32)
Party Floor 1			49.7000			30.0000	1491.0000 (32a)
Internal Wall 1			113.7600			9.0000	1023.8400 (32c)
Internal Floor 1			6.0000			18.0000	108.0000 (32d)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9578.9400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							150.3758 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	

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E16 Corner (normal)	7.2000	0.0570	0.4104
P1 Party wall - Ground floor	6.0000	0.3200	1.9200
E2 Other lintels (including other steel lintels)	6.9300	0.0480	0.3326
E3 Sill	6.0000	0.0450	0.2700
E4 Jamb	15.0000	0.0510	0.7650
E6 Intermediate floor within a dwelling	6.1000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	21.7000	0.0640	1.3888
E18 Party wall between dwellings	9.6000	0.0620	0.5952
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.4000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	9.4000	0.4800	4.5120
E10 Eaves (insulation at ceiling level)	21.7000	0.0840	1.8228
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			12.0168 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	40.8886 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.4677	28.3418	28.2184	27.6387	27.5302	27.0253	27.0253	26.9318	27.2198	27.5302	27.7496	27.9790	(38)
Heat transfer coeff	69.3564	69.2304	69.1070	68.5273	68.4189	67.9140	67.9140	67.8205	68.1085	68.4189	68.6383	68.8677	(39)
Average = Sum(39)m / 12 =												68.5268	
HLP	1.0888	1.0868	1.0849	1.0758	1.0741	1.0662	1.0662	1.0647	1.0692	1.0741	1.0775	1.0811	(40)
HLP (average)												1.0758	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.0841 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	24.9953	24.6180	24.0812	23.2773	22.5529	21.5556	20.7990	21.7242	22.2097	23.1979	24.2253	24.9754	(42b)
Hot water usage for other uses	35.9731	34.6650	33.3569	32.0488	30.7407	29.4325	29.4325	30.7407	32.0488	33.3569	34.6650	35.9731	(42c)
Average daily hot water use (litres/day)												55.8794	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	60.9684	59.2830	57.4381	55.3261	53.2935	50.9881	50.2315	52.4648	54.2585	56.5548	58.8903	60.9486	(44)
Energy content (annual)	89.7560	78.4433	82.0778	72.2697	68.6741	58.9661	55.5073	61.7521	62.9372	72.8766	79.5922	89.5074	(45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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	(59)
Total heat required for water heating calculated for each month													
WWHRS	76.2926	66.6768	69.7661	61.4293	58.3730	50.1212	47.1812	52.4893	53.4966	61.9451	67.6534	76.0813	(62)
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	(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	76.2926	66.6768	69.7661	61.4293	58.3730	50.1212	47.1812	52.4893	53.4966	61.9451	67.6534	76.0813	(64)
12Total per year (kWh/year)												741.5058	(64)
Electric shower(s)	47.3796	42.2156	46.0978	43.9906	44.8160	42.7502	44.1752	44.8160	43.9906	46.0978	45.2310	47.3796	(64a)
Heat gains from water heating, kWh/month	30.9180	27.2231	28.9660	26.3550	25.7973	23.2178	22.8391	24.3263	24.3718	27.0107	28.2211	30.8652	(65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												538.9400	(64a)

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	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	100.6872	111.4751	100.6872	104.0435	100.6872	104.0435	100.6872	100.6872	104.0435	100.6872	104.0435	100.6872	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	182.1728	184.0632	179.2995	169.1581	156.3565	144.3247	136.2868	134.3964	139.1601	149.3014	162.1031	174.1348	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	(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)	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	(71)
Water heating gains (Table 5)	41.5565	40.5106	38.9328	36.6041	34.6737	32.2470	30.6977	32.6967	33.8497	36.3047	39.1960	41.4855	(72)
Total internal gains	378.6778	390.3102	373.1808	364.0670	345.9787	334.8764	321.9330	322.0416	331.3145	340.5547	359.6038	370.5689	(73)

6. Solar gains

[Jan]													
					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d	Gains W	
North					4.0500	10.6334	0.5100		0.0000		0.7700	16.9117 (74)	
South					4.0500	46.7521	0.5100		0.0000		0.7700	74.3561 (78)	
Solar gains	91.2678	154.0953	210.0394	263.5333	301.5255	303.0306	290.5542	261.0554	228.0719	169.8188	109.0001	78.3490	(83)
Total gains	469.9456	544.4055	583.2201	627.6003	647.5042	637.9071	612.4871	583.0969	559.3864	510.3734	468.6039	448.9178	(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	38.3644	38.4342	38.5028	38.8285	38.8901	39.1792	39.1792	39.2332	39.0673	38.8901	38.7658	38.6367	
alpha	3.5576	3.5623	3.5669	3.5886	3.5927	3.6119	3.6119	3.6155	3.6045	3.5927	3.5844	3.5758	
util living area	0.9756	0.9586	0.9338	0.8760	0.7754	0.6159	0.4685	0.5076	0.7102	0.8905	0.9586	0.9790 (86)	
MIT	19.2524	19.5188	19.8563	20.2997	20.6634	20.8951	20.9701	20.9598	20.8175	20.3555	19.7353	19.2044 (87)	
Th 2	20.0100	20.0116	20.0132	20.0207	20.0221	20.0286	20.0286	20.0298	20.0261	20.0221	20.0192	20.0163 (88)	
util rest of house	0.9708	0.9507	0.9207	0.8509	0.7295	0.5414	0.3729	0.4112	0.6418	0.8632	0.9493	0.9749 (89)	
MIT 2	18.4282	18.6907	19.0210	19.4491	19.7787	19.9699	20.0174	20.0137	19.9141	19.5103	18.9123	18.3856 (90)	
Living area fraction									fLA = Living area / (4) =				0.3187 (91)
MIT	18.6909	18.9546	19.2872	19.7202	20.0606	20.2647	20.3210	20.3152	20.2020	19.7796	19.1745	18.6465 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.6909	18.9546	19.2872	19.7202	20.0606	20.2647	20.3210	20.3152	20.2020	19.7796	19.1745	18.6465 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9625	0.9401	0.9091	0.8421	0.7314	0.5604	0.4025	0.4406	0.6552	0.8553	0.9393	0.9673 (94)
Useful gains	452.3219	511.7977	530.2326	528.5097	473.6041	357.4928	246.5404	256.8843	366.4883	436.5122	440.1392	434.2194 (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	998.0974	973.0068	883.6845	741.4790	572.0251	384.7158	252.7097	265.5278	415.5991	628.0608	828.7762	994.8974 (97)
Space heating kWh	406.0570	309.9325	262.9683	153.3379	73.2252	0.0000	0.0000	0.0000	0.0000	142.5122	279.8186	417.1445 (98a)
Space heating requirement - total per year (kWh/year)												2044.9961
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	406.0570	309.9325	262.9683	153.3379	73.2252	0.0000	0.0000	0.0000	0.0000	142.5122	279.8186	417.1445 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2044.9961
Space heating per m2										(98c) / (4) =		32.1035 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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												
	0.0000	0.0000	0.0000	0.0000	0.0000	638.3915	502.5636	515.4358	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8187	0.8814	0.8601	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	522.6499	442.9639	443.3395	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	701.9287	674.5091	642.0617	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	129.0807	172.2696	147.8493	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	32.2702	43.0674	36.9623	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												112.2999 (107)
Energy for space heating												32.1035 (99)
Energy for space cooling												1.7629 (108)
Total												33.8665 (109)
Fabric Energy Efficiency (DFEE)												33.9 (109)

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

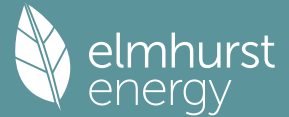
1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	6.0000 (1b)	x 2.4000 (2b)	= 14.4000 (1b) - (3b)
First floor	57.7000 (1c)	x 2.4000 (2c)	= 138.4800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	152.8800 (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)

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Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											Air changes per hour	
Pressure test												20.0000 / (5) =	0.1308 (8)
Pressure Test Method												Yes	
Measured/design AP50												Blower Door	
Infiltration rate												5.0000 (17)	
Number of sides sheltered												0.3808 (18)	
												2 (19)	
Shelter factor												(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) =	0.3237 (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)
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)
	0.4127	0.4046	0.3965	0.3561	0.3480	0.3075	0.3075	0.2994	0.3237	0.3480	0.3642	0.3803	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5852	0.5819	0.5786	0.5634	0.5605	0.5473	0.5473	0.5448	0.5524	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 Semi-glazed door			1.9600	1.0000	1.9600		(26a)
TER Opening Type			8.1000	1.1450	9.2748		(27)
Heatloss Floor 1			6.0000	0.1300	0.7800		(28a)
External Wall 1	66.7200	10.0600	56.6600	0.1800	10.1988		(29a)
Planned Roof	57.7000		57.7000	0.1100	6.3470		(30)
Total net area of external elements Aum(A, m2)			130.4200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	28.5606	(33)
Main dwelling							
Party Wall 1			36.9600	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							150.3758 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E16 Corner (normal)				7.2000	0.0900	0.6480	
P1 Party wall - Ground floor				6.0000	0.0800	0.4800	
E2 Other lintels (including other steel lintels)				6.9300	0.0500	0.3465	
E3 Sill				6.0000	0.0500	0.3000	
E4 Jamb				15.0000	0.0500	0.7500	
E6 Intermediate floor within a dwelling				6.1000	0.0000	0.0000	
E7 Party floor between dwellings (in blocks of flats)				21.7000	0.0700	1.5190	
E18 Party wall between dwellings				9.6000	0.0600	0.5760	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				9.4000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)				9.4000	0.1200	1.1280	
E10 Eaves (insulation at ceiling level)				21.7000	0.0600	1.3020	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.0495 (36)
Point Thermal bridges							(36a) = 0.0000
Total fabric heat loss							(33) + (36) + (36a) = 35.6101 (37)

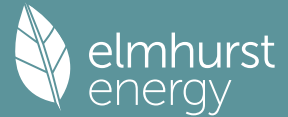
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	29.5219	29.3551	29.1915	28.4234	28.2796	27.6106	27.6106	27.4867	27.8683	28.2796	28.5704	28.8743	(38)
Average = Sum(39)m / 12 =	65.1320	64.9652	64.8016	64.0335	63.8898	63.2207	63.2207	63.0968	63.4784	63.8898	64.1805	64.4845	(39)
												64.0328	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0225	1.0199	1.0173	1.0052	1.0030	0.9925	0.9925	0.9905	0.9965	1.0030	1.0075	1.0123	(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												2.0841 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	25.5652	25.1855	24.6508	23.6650	22.9268	22.1083	21.6662	22.1971	22.7752	23.6510	24.6572	25.4788 (42b)
Hot water usage for other uses	35.9731	34.6650	33.3569	32.0488	30.7407	29.4325	29.4325	30.7407	32.0488	33.3569	34.6650	35.9731 (42c)
Average daily hot water use (litres/day)												56.4058 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	61.5383	59.8505	58.0077	55.7138	53.6675	51.5409	51.0987	52.9378	54.8240	57.0079	59.3222	61.4519 (44)
Energy content (annual)	97.4616	85.2263	89.1557	76.2694	72.2468	63.3755	61.7995	65.5480	67.6034	77.3592	84.5153	96.2188 (45)
Distribution loss (46)m = 0.15 x (45)m	Total = Sum(45)m =											936.7796
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	82.8424	72.4424	75.7824	64.8290	61.4097	53.8692	52.5296	55.7158	57.4629	65.7553	71.8380	81.7860 (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	82.8424	72.4424	75.7824	64.8290	61.4097	53.8692	52.5296	55.7158	57.4629	65.7553	71.8380	81.7860 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											796.2626 (64)
Electric shower(s)	47.3796	42.2156	46.0978	43.9906	44.8160	42.7502	44.1752	44.8160	43.9906	46.0978	45.2310	47.3796 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											538.9400 (64a)

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Heat gains from water heating, kWh/month
32.5555 28.6645 30.4700 27.2049 26.5564 24.1548 24.1762 25.1330 25.3634 27.9633 29.2673 32.2914 (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	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	100.6872	111.4751	100.6872	104.0435	100.6872	104.0435	100.6872	100.6872	104.0435	100.6872	104.0435	100.6872	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	182.1728	184.0632	179.2995	169.1581	156.3565	144.3247	136.2868	134.3964	139.1601	149.3014	162.1031	174.1348	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	(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)	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	(71)
Water heating gains (Table 5)	43.7574	42.6555	40.9544	37.7846	35.6942	33.5484	32.4949	33.7809	35.2269	37.5851	40.6490	43.4024	(72)
Total internal gains	380.8787	392.4551	375.2023	365.2474	346.9991	336.1778	323.7301	323.1257	332.6917	341.8350	361.0568	372.4857	(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				4.0500	10.6334	0.6300		0.7000		0.7700		13.1613 (74)			
South				4.0500	46.7521	0.6300		0.7000		0.7700		57.8666 (78)			
Solar gains				71.0279	119.9224	163.4601	205.0909	234.6578	235.8291	226.1195	203.1625	177.4936	132.1590	84.8278	60.9739 (83)
Total gains				451.9065	512.3775	538.6624	570.3383	581.6569	572.0070	549.8496	526.2883	510.1853	473.9940	445.8846	433.4597 (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	40.8527	40.9576	41.0610	41.5535	41.6470	42.0877	42.0877	42.1704	41.9169	41.6470	41.4583	41.2629	
alpha	3.7235	3.7305	3.7374	3.7702	3.7765	3.8058	3.8058	3.8114	3.7945	3.7765	3.7639	3.7509	
util living area	0.9774	0.9631	0.9425	0.8918	0.7990	0.6390	0.4865	0.5243	0.7273	0.9000	0.9618	0.9804	(86)
MIT	19.3572	19.5941	19.9001	20.3198	20.6690	20.8997	20.9726	20.9633	20.8285	20.3919	19.8171	19.3211	(87)
Th 2	20.0646	20.0668	20.0689	20.0790	20.0809	20.0896	20.0896	20.0912	20.0862	20.0809	20.0771	20.0731	(88)
util rest of house	0.9731	0.9561	0.9312	0.8696	0.7567	0.5676	0.3937	0.4313	0.6627	0.8752	0.9534	0.9766	(89)
MIT 2	18.5718	18.8061	19.1071	19.5172	19.8372	20.0321	20.0790	20.0760	19.9789	19.5928	19.0358	18.5424	(90)
Living area fraction	18.8221	19.0572	19.3598	19.7730	20.1023	20.3086	20.3638	20.3588	20.2496	19.8474	19.2848	18.7905	(92)
MIT	18.8221	19.0572	19.3598	19.7730	20.1023	20.3086	20.3638	20.3588	20.2496	19.8474	19.2848	18.7905	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8221	19.0572	19.3598	19.7730	20.1023	20.3086	20.3638	20.3588	20.2496	19.8474	19.2848	18.7905	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9656	0.9467	0.9207	0.8611	0.7578	0.5856	0.4224	0.4596	0.6751	0.8678	0.9443	0.9698	(94)
Useful gains	436.3482	485.0705	495.9703	491.1321	440.7917	334.9873	232.2775	241.9046	344.4422	411.3293	421.0475	420.3560	(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	945.8527	919.7248	833.3359	696.2336	536.8214	360.9030	237.9485	249.7877	390.3692	590.8158	782.0252	940.8629	(97)
Space heating kWh	379.0714	292.0877	251.0000	147.6731	71.4462	0.0000	0.0000	0.0000	0.0000	133.5380	259.9039	387.2571	(98a)
Space heating requirement - total per year (kWh/year)												1921.9774	
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	379.0714	292.0877	251.0000	147.6731	71.4462	0.0000	0.0000	0.0000	0.0000	133.5380	259.9039	387.2571	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1921.9774	
Space heating per m2										(98c) / (4) =		30.1723	(99)

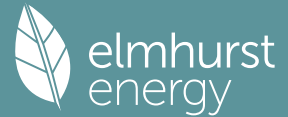
8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
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	0.0000	0.0000	0.0000	0.0000	0.0000	594.2747	467.8333	479.5358	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8112	0.8780	0.8576	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	482.0778	410.7448	411.2448	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	624.6829	600.9930	575.4789	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	102.6757	141.5447	122.1902	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fc = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	25.6689	35.3862	30.5475	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												91.6026	(107)
Energy for space heating												30.1723	(99)
Energy for space cooling												1.4380	(108)
Total												31.6104	(109)

Fabric Energy Efficiency (TFEE)

31.6 (109)

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Property Reference	P3 Ladds				Issued on Date	21/08/2025
Assessment Reference	1st Flr Flat	Prop Type Ref		Semi		
Property	1, Bath Road, Hare Hatch, Berkshire, RG10 9SA					
SAP Rating	69 C	DER	7.86	TER	11.57	
Environmental	94 A	% DER < TER				32.07
CO ₂ Emissions (t/year)	0.47	DFEE	33.87	TFEE	31.61	
Compliance Check	See BREL	% DFEE < TFEE				-7.14
% DPER < TPER	-36.70	DPER	82.77	TPER	60.55	
Assessor Details	Mrs. Rebecca Lennon				Assessor ID	P627-0001
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	6.0000 (1b)	x 2.4000 (2b)	= 14.4000 (1b) - (3b)
First floor	57.7000 (1c)	x 2.4000 (2c)	= 138.4800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 152.8800 (5)

2. Ventilation rate

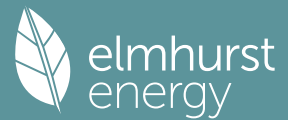
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	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) = 0.1308 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3308 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2812 (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	0.3585	0.3515	0.3445	0.3093	0.3023	0.2671	0.2671	0.2601	0.2812	0.3023	0.3163	0.3304 (22b)
Effective ac	0.5643	0.5618	0.5593	0.5478	0.5457	0.5357	0.5357	0.5338	0.5395	0.5457	0.5500	0.5546 (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							
Ent Door			1.9600	1.2000	2.3520		(26a)
Windows			8.1000	1.1450	9.2748		(27)
Heatloss Floor 1			6.0000	0.1200	0.7200	75.0000	450.0000 (28a)
External Wall 1	66.7200	10.0600	56.6600	0.2000	11.3320	60.0000	3399.6000 (29a)
Planned Roof	57.7000		57.7000	0.0900	5.1930	9.0000	519.3000 (30)
Total net area of external elements Aum(A, m ²)			130.4200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.8718		(33)
Main dwelling							
Party Wall 1			36.9600	0.0000	0.0000	70.0000	2587.2000 (32)
Party Floor 1			49.7000			30.0000	1491.0000 (32d)
Internal Wall 1			113.7600			9.0000	1023.8400 (32c)
Internal Floor 1			6.0000			18.0000	108.0000 (32d)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9578.9400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							150.3758 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E16 Corner (normal)				7.2000	0.0570	0.4104	
P1 Party wall - Ground floor				6.0000	0.3200	1.9200	

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E2 Other lintels (including other steel lintels)	6.9300	0.0480	0.3326
E3 Sill	6.0000	0.0450	0.2700
E4 Jamb	15.0000	0.0510	0.7650
E6 Intermediate floor within a dwelling	6.1000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	21.7000	0.0640	1.3888
E18 Party wall between dwellings	9.6000	0.0620	0.5952
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.4000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	9.4000	0.4800	4.5120
E10 Eaves (insulation at ceiling level)	21.7000	0.0840	1.8228
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			12.0168 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	40.8886 (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	28.4677	28.3418	28.2184	27.6387	27.5302	27.0253	27.0253	26.9318	27.2198	27.5302	27.7496	27.9790 (38)
Average = Sum(39)m / 12 =	69.3564	69.2304	69.1070	68.5273	68.4189	67.9140	67.9140	67.8205	68.1085	68.4189	68.6383	68.8677 (39)
												68.5268
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0888	1.0868	1.0849	1.0758	1.0741	1.0662	1.0662	1.0647	1.0692	1.0741	1.0775	1.0811 (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												2.0841 (42)
Hot water usage for mixer showers												
Hot water usage for baths	57.6681	56.7852	55.4841	53.4825	51.6891	49.1801	47.1957	49.5156	50.6824	53.1674	55.7553	57.6161 (42a)
Hot water usage for other uses	24.9953	24.6180	24.0812	23.2773	22.5529	21.5556	20.7990	21.7242	22.2097	23.1979	24.2253	24.9754 (42b)
Average daily hot water use (litres/day)	35.9731	34.6650	33.3569	32.0488	30.7407	29.4325	29.4325	30.7407	32.0488	33.3569	34.6650	35.9731 (42c)
												109.0449 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	118.6365	116.0682	112.9221	108.8086	104.9826	100.1683	97.4272	101.9804	104.9409	109.7222	114.6456	118.5647 (44)
Energy content (annual)	174.6534	153.5817	161.3634	142.1312	135.2807	115.8412	107.6600	120.0329	121.7262	141.3882	154.9474	174.1209 (45)
Distribution loss (46)m = 0.15 x (45)m	26.1980	23.0373	24.2045	21.3197	20.2921	17.3762	16.1490	18.0049	18.2589	21.2082	23.2421	26.1181 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.9400 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.5076 (55)
Total storage loss	15.7356	14.2128	15.7356	15.2280	15.7356	15.2280	15.7356	15.7356	15.2280	15.7356	15.2280	15.7356 (56)
If cylinder contains dedicated solar storage	15.7356	14.2128	15.7356	15.2280	15.7356	15.2280	15.7356	15.7356	15.2280	15.7356	15.2280	15.7356 (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	213.6514	188.8057	200.3614	179.8712	174.2787	153.5812	146.6580	159.0309	159.4662	180.3862	192.6874	213.1189 (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	213.6514	188.8057	200.3614	179.8712	174.2787	153.5812	146.6580	159.0309	159.4662	180.3862	192.6874	213.1189 (64)
												2161.8971 (64)
12Total per year (kWh/year)												2162 (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	89.2707	79.2451	84.8517	77.4506	76.1792	68.7092	66.9953	71.1093	70.6660	78.2100	81.7120	89.0936 (65)

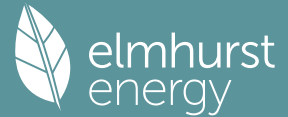
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	100.6872	111.4751	100.6872	104.0435	100.6872	104.0435	100.6872	100.6872	104.0435	100.6872	104.0435	100.6872 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	182.1728	184.0632	179.2995	169.1581	156.3565	144.3247	136.2868	134.3964	139.1601	149.3014	162.1031	174.1348 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204 (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)	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634 (71)
Water heating gains (Table 5)	119.9875	117.9243	114.0480	107.5703	102.3914	95.4295	90.0475	95.5770	98.1472	105.1209	113.4889	119.7495 (72)
Total internal gains	457.1087	467.7239	448.2960	435.0331	413.6964	398.0589	381.2828	384.9219	395.6120	409.3709	433.8967	448.8328 (73)

6. Solar gains

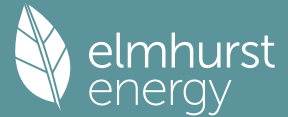
[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				4.0500	10.6334		0.5100		0.0000		0.7700		16.9117 (74)
South				4.0500	46.7521		0.5100		0.0000		0.7700		74.3561 (78)
Solar gains	91.2678	154.0953	210.0394	263.5333	301.5255	303.0306	290.5542	261.0554	228.0719	169.8188	109.0001		78.3490 (83)
Total gains	548.3766	621.8192	658.3354	698.5665	715.2219	701.0895	671.8369	645.9773	623.6839	579.1896	542.8969		527.1818 (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	38.3644	38.4342	38.5028	38.8285	38.8901	39.1792	39.1792	39.2332	39.0673	38.8901	38.7658	38.6367
alpha	3.5576	3.5623	3.5669	3.5886	3.5927	3.6119	3.6119	3.6155	3.6045	3.5927	3.5844	3.5758
util living area	0.9619	0.9406	0.9101	0.8436	0.7344	0.5729	0.4312	0.4643	0.6616	0.8548	0.9382	0.9663 (86)
Living	19.7319	19.9207	20.1582	20.4633	20.7054	20.8524	20.8975	20.8921	20.8065	20.5071	20.0785	19.6984
Non living	18.5385	18.7753	19.0710	19.4451	19.7218	19.8753	19.9110	19.9090	19.8335	19.5054	18.9822	18.5013
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	31	28	31	30	31	30	31	31	30	31	30	31
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000 (87)
Th 2	20.0100	20.0116	20.0132	20.0207	20.0221	20.0286	20.0286	20.0298	20.0261	20.0221	20.0192	20.0163 (88)
util rest of house												
	0.9548	0.9299	0.8937	0.8147	0.6859	0.5001	0.3416	0.3738	0.5922	0.8221	0.9253	0.9600 (89)
MIT 2	20.0100	20.0116	20.0132	20.0207	20.0221	20.0286	20.0286	20.0298	20.0261	20.0221	20.0192	20.0163 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	20.3255	20.3266	20.3277	20.3328	20.3337	20.3381	20.3381	20.3390	20.3364	20.3337	20.3318	20.3298 (92)
Temperature adjustment												0.0000
adjusted MIT	20.3255	20.3266	20.3277	20.3328	20.3337	20.3381	20.3381	20.3390	20.3364	20.3337	20.3318	20.3298 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9573	0.9335	0.8993	0.8245	0.7022	0.5241	0.3708	0.4034	0.6155	0.8333	0.9298	0.9622 (94)
Useful gains	524.9383	580.4875	592.0302	575.9918	502.2221	367.4667	249.1211	260.5973	383.8511	482.6345	504.7619	507.2463 (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	1111.4695	1067.9898	955.5894	783.4564	590.7087	389.7004	253.8725	267.1428	424.7541	665.9695	908.2070	1110.8198 (97)
Space heating kWh	436.3792	327.6016	270.4881	149.3745	65.8341	0.0000	0.0000	0.0000	0.0000	136.4012	290.4805	449.0587 (98a)
Space heating requirement - total per year (kWh/year)												2125.6179
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	436.3792	327.6016	270.4881	149.3745	65.8341	0.0000	0.0000	0.0000	0.0000	136.4012	290.4805	449.0587 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2125.6179
Space heating per m2										(98c) / (4) =		33.3692 (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 %)												201.0448 (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	436.3792	327.6016	270.4881	149.3745	65.8341	0.0000	0.0000	0.0000	0.0000	136.4012	290.4805	449.0587 (98)
Space heating efficiency (main heating system 1)	201.0448	201.0448	201.0448	201.0448	201.0448	0.0000	0.0000	0.0000	0.0000	201.0448	201.0448	201.0448 (210)
Space heating fuel (main heating system)	217.0557	162.9495	134.5412	74.2991	32.7460	0.0000	0.0000	0.0000	0.0000	67.8462	144.4854	223.3625 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement												
	213.6514	188.8057	200.3614	179.8712	174.2787	153.5812	146.6580	159.0309	159.4662	180.3862	192.6874	213.1189 (64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month	213.6514	188.8057	200.3614	179.8712	174.2787	153.5812	146.6580	159.0309	159.4662	180.3862	192.6874	213.1189 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	24.6261	19.7560	17.7881	13.0323	10.0665	8.2244	9.1830	11.9364	15.5043	20.3424	22.9767	25.3105 (232)
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 (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												1057.2856 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												100.0000
Water heating fuel used												2161.8971 (219)
Space cooling fuel												0.0000 (221)

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Electricity for pumps and fans:
 Total electricity for the above, kWh/year 0.0000 (231)
 Electricity for lighting (calculated in Appendix L) 198.7468 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
 PV generation 0.0000 (233)
 Wind generation 0.0000 (234)
 Hydro-electric generation (Appendix N) 0.0000 (235a)
 Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
 Appendix Q - special features
 Energy saved or generated -0.0000 (236)
 Energy used 0.0000 (237)
 Total delivered energy for all uses 3417.9295 (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 (high-rate cost)	845.8285	0.1632	138.0341 (261)
Space heating - main system 1 (low-rate cost)	211.4571	0.1370	28.9721 (261)
Total CO2 associated with community systems			0.0000 (261)
Water heating - high rate cost	1513.3280	0.1479	223.8321 (264)
Water heating - low rate cost	648.5691	0.1241	80.5113 (264)
Space and water heating			471.3496 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	198.7468	0.1490	29.6172 (268)
Total CO2, kg/year			500.9669 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			7.8600 (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 (high-rate cost)	845.8285	1.2867	1360.4289 (275)
Space heating - main system 1 (low-rate cost)	211.4571	1.4959	316.3121 (275)
Total CO2 associated with community systems			0.0000 (275)
Water heating - high rate cost	1513.3280	1.5529	2350.0272 (278)
Water heating - low rate cost	648.5691	1.4442	936.6872 (278)
Space and water heating			4963.4554 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	198.7468	1.5547	309.0005 (282)
Total Primary energy kWh/year			5272.4559 (286)
Dwelling Primary energy Rate (DPER)			82.7700 (287)

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

1. Overall dwelling characteristics

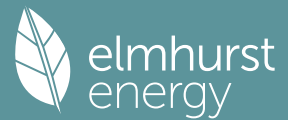
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	6.0000 (1b)	x 2.4000 (2b)	= 14.4000 (1b) - (3b)
First floor	57.7000 (1c)	x 2.4000 (2c)	= 138.4800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	152.8800 (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) = 0.1308 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3808	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3237 (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	0.4127	0.4046	0.3965	0.3561	0.3480	0.3075	0.3075	0.2994	0.3237	0.3480	0.3642	0.3803 (22b)
Effective ac	0.5852	0.5819	0.5786	0.5634	0.5605	0.5473	0.5473	0.5448	0.5524	0.5605	0.5663	0.5723 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Semi-glazed door			1.9600	1.0000	1.9600			(26a)
TER Opening Type			8.1000	1.1450	9.2748			(27)
Heatloss Floor 1			6.0000	0.1300	0.7800			(28a)
External Wall 1	66.7200	10.0600	56.6600	0.1800	10.1988			(29a)
Planned Roof	57.7000		57.7000	0.1100	6.3470			(30)
Total net area of external elements Aum(A, m2)			130.4200					(31)
Fabric heat loss, W/K = Sum (A x U)					28.5606			(33)
Main dwelling								
Party Wall 1			36.9600	0.0000	0.0000			(32)

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

150.3758 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E16 Corner (normal)	7.2000	0.0900	0.6480	
P1 Party wall - Ground floor	6.0000	0.0800	0.4800	
E2 Other lintels (including other steel lintels)	6.9300	0.0500	0.3465	
E3 Sill	6.0000	0.0500	0.3000	
E4 Jamb	15.0000	0.0500	0.7500	
E6 Intermediate floor within a dwelling	6.1000	0.0000	0.0000	
E7 Party floor between dwellings (in blocks of flats)	21.7000	0.0700	1.5190	
E18 Party wall between dwellings	9.6000	0.0600	0.5760	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.4000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	9.4000	0.1200	1.1280	
E10 Eaves (insulation at ceiling level)	21.7000	0.0600	1.3020	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				7.0495 (36)
Point Thermal bridges				0.0000
Total fabric heat loss				(33) + (36) + (36a) = 35.6101 (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	29.5219	29.3551	29.1915	28.4234	28.2796	27.6106	27.6106	27.4867	27.8683	28.2796	28.5704	28.8743	(38)
Average = Sum(39)m / 12 =	65.1320	64.9652	64.8016	64.0335	63.8898	63.2207	63.2207	63.0968	63.4784	63.8898	64.1805	64.4845	(39)
												64.0328	
HLP	1.0225	1.0199	1.0173	1.0052	1.0030	0.9925	0.9925	0.9905	0.9965	1.0030	1.0075	1.0123	(40)
HLP (average)												1.0052	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

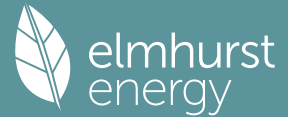
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.0841 (42)
Hot water usage for mixer showers													
59.1629	58.2737	56.9781	54.4993	52.6699	50.6298	49.4702	50.7560	52.1655	54.3559	56.8881	58.9362	58.9362	(42a)
Hot water usage for baths													
25.5652	25.1855	24.6508	23.6650	22.9268	22.1083	21.6662	22.1971	22.7752	23.6510	24.6572	25.4788	25.4788	(42b)
Hot water usage for other uses													
35.9731	34.6650	33.3569	32.0488	30.7407	29.4325	29.4325	30.7407	32.0488	33.3569	34.6650	35.9731	35.9731	(42c)
Average daily hot water use (litres/day)												110.9520	(43)
Daily hot water use													
120.7012	118.1243	114.9859	110.2130	106.3374	102.1707	100.5690	103.6938	106.9895	111.3639	116.2102	120.3880	120.3880	(44)
Energy conte	191.1611	168.2074	176.7290	150.8761	143.1506	125.6308	121.6294	128.3946	131.9287	151.1197	165.5628	188.4986	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
28.6742	25.2311	26.5094	22.6314	21.4726	18.8446	18.2444	19.2592	19.7893	22.6680	24.8344	28.2748	28.2748	(46)
Water storage loss:													
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.3938 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.7527 (55)
Total storage loss													
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	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	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	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													
237.7560	210.2931	223.3239	195.9680	189.7455	170.7226	168.2243	174.9895	177.0205	197.7146	210.6546	235.0935	235.0935	(62)
WWHRS	-27.0468	-23.9204	-25.0481	-20.7408	-19.3297	-16.5405	-15.5041	-16.4871	-17.1135	-20.1749	-22.8557	-26.5459	(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													
210.7092	186.3727	198.2759	175.2272	170.4158	154.1821	152.7202	158.5024	159.9071	177.5397	187.7989	208.5476	208.5476	(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	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													
100.8370	89.5975	96.0383	86.2398	84.8735	77.8457	77.7177	79.9671	79.9398	87.5232	91.1231	99.9517	99.9517	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
100.6872	111.4751	100.6872	104.0435	100.6872	104.0435	100.6872	100.6872	104.0435	100.6872	104.0435	100.6872	100.6872	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
182.1728	184.0632	179.2995	169.1581	156.3565	144.3247	136.2868	134.3964	139.1601	149.3014	162.1031	174.1348	174.1348	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	(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)													

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	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634 (71)
Water heating gains (Table 5)	135.5336	133.3296	129.0838	119.7775	114.0773	108.1190	104.4593	107.4827	111.0275	117.6387	126.5599	134.3437 (72)
Total internal gains	475.6549	486.1292	466.3317	450.2403	428.3822	410.7485	395.6946	396.8276	408.4923	424.8887	449.9677	466.4270 (73)

6. Solar gains

[Jan]	Area		Solar flux		Specific data		Specific data		Access		Gains	
	m2		Table 6a		or Table 6b		or Table 6c		factor		W	
			W/m2						Table 6d			
North	4.0500		10.6334		0.6300		0.7000		0.7700		13.1613 (74)	
South	4.0500		46.7521		0.6300		0.7000		0.7700		57.8666 (78)	
Solar gains	71.0279	119.9224	163.4601	205.0909	234.6578	235.8291	226.1195	203.1625	177.4936	132.1590	84.8278	60.9739 (83)
Total gains	546.6827	606.0517	629.7918	655.3313	663.0400	646.5776	621.8141	599.9901	585.9858	557.0476	534.7955	527.4010 (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	40.8527	40.9576	41.0610	41.5535	41.6470	42.0877	42.0877	42.1704	41.9169	41.6470	41.4583	41.2629	
alpha	3.7235	3.7305	3.7374	3.7702	3.7765	3.8058	3.8058	3.8114	3.7945	3.7765	3.7639	3.7509	
util living area	0.9601	0.9406	0.9130	0.8509	0.7453	0.5818	0.4355	0.4676	0.6643	0.8541	0.9360	0.9643 (86)	
MIT	19.5686	19.7889	20.0714	20.4451	20.7442	20.9271	20.9811	20.9751	20.8752	20.5176	20.0002	19.5343 (87)	
Th 2	20.0646	20.0668	20.0689	20.0790	20.0809	20.0896	20.0896	20.0912	20.0862	20.0809	20.0771	20.0731 (88)	
util rest of house	0.9529	0.9302	0.8974	0.8238	0.6992	0.5122	0.3503	0.3817	0.5981	0.8224	0.9231	0.9579 (89)	
MIT 2	18.4139	18.6902	19.0424	19.5019	19.8451	20.0374	20.0805	20.0784	19.9892	19.5966	18.9657	18.3768 (90)	
Living area fraction									fLA = Living area / (4) =				0.3187 (91)
MIT	18.7819	19.0403	19.3703	19.8025	20.1316	20.3210	20.3675	20.3641	20.2716	19.8901	19.2954	18.7457 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.7819	19.0403	19.3703	19.8025	20.1316	20.3210	20.3675	20.3641	20.2716	19.8901	19.2954	18.7457 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9403	0.9162	0.8835	0.8146	0.7019	0.5306	0.3769	0.4081	0.6123	0.8150	0.9098	0.9460 (94)
Useful gains	514.0448	555.2487	556.4138	533.8365	465.4060	343.0762	234.3344	244.8504	358.8003	453.9709	486.5412	498.9189 (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	943.2357	918.6276	834.0181	698.1257	538.6954	361.6835	238.1840	250.1244	391.7606	593.5410	782.7047	937.9695 (97)
Space heating kWh	319.3180	244.1907	206.5376	118.2883	54.5273	0.0000	0.0000	0.0000	0.0000	103.8402	213.2377	326.6537 (98a)
Space heating requirement - total per year (kWh/year)												1586.5934
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	319.3180	244.1907	206.5376	118.2883	54.5273	0.0000	0.0000	0.0000	0.0000	103.8402	213.2377	326.6537 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1586.5934
Space heating per m2										(98c) / (4) =		24.9073 (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	319.3180	244.1907	206.5376	118.2883	54.5273	0.0000	0.0000	0.0000	0.0000	103.8402	213.2377	326.6537 (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)	345.9567	264.5619	223.7677	128.1563	59.0762	0.0000	0.0000	0.0000	0.0000	112.5029	231.0268	353.9043 (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	210.7092	186.3727	198.2759	175.2272	170.4158	154.1821	152.7202	158.5024	159.9071	177.5397	187.7989	208.5476 (64)
Efficiency of water heater	84.9894	84.6667	84.1515	83.1982	81.8099	79.8000	79.8000	79.8000	79.8000	82.9007	84.3454	85.0618 (217)
Fuel for water heating, kWh/month	247.9241	220.1251	235.6178	210.6141	208.3070	193.2106	191.3787	198.6246	200.3848	214.1595	222.6546	245.1718 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	20.9208	16.7835	15.1116	11.0714	8.5519	6.9870	7.8013	10.1405	13.1715	17.2817	19.5196	21.5023 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-30.0933	-42.5709	-61.4019	-69.2951	-74.9596	-70.0805	-69.2524	-65.2902	-58.2892	-48.8425	-33.1510	-26.0035 (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)												

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(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	-16.5414	-34.8579	-69.3866	-104.3520	-138.0960	-138.7705	-137.1002	-115.9930	-84.9270	-49.8504	-22.0882	-13.0726	(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												1718.9528	(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												2588.1728	(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)												168.8430	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1574.2660	(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												2987.7025	(238)

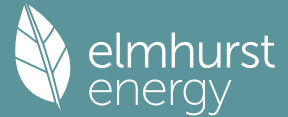
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1718.9528	0.2100	360.9801 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2588.1728	0.2100	543.5163 (264)
Space and water heating			904.4964 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	168.8430	0.1443	24.3693 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-649.2301	0.1345	-87.3223
PV Unit electricity exported	-925.0360	0.1259	-116.4278
Total			-203.7501 (269)
Total CO2, kg/year			737.0448 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.5700 (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	1718.9528	1.1300	1942.4167 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2588.1728	1.1300	2924.6353 (278)
Space and water heating			4867.0519 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	168.8430	1.5338	258.9770 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-649.2301	1.4971	-971.9555
PV Unit electricity exported	-925.0360	0.4620	-427.3692
Total			-1399.3246 (283)
Total Primary energy kWh/year			3856.8051 (286)
Target Primary Energy Rate (TPER)			60.5500 (287)

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Property Reference	P5 Ladds				Issued on Date	21/08/2025
Assessment Reference	Semi		Prop Type Ref	Semi		
Property	1, Bath Road, Hare Hatch, Berkshire, RG10 9SA					
SAP Rating	82 B	DER	3.54	TER	8.44	
Environmental	96 A	% DER < TER				58.06
CO ₂ Emissions (t/year)	0.51	DFEE	34.67	TFEE	35.35	
Compliance Check	See BREL	% DFEE < TFEE				1.92
% DPER < TPER	16.59	DPER	36.69	TPER	43.99	
Assessor Details	Mrs. Rebecca Lennon				Assessor ID	P627-0001
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	71.9000 (1b)	x	2.4000 (2b)	=	172.5600 (1b) - (3b)
First floor	63.7000 (1c)	x	2.6000 (2c)	=	165.6200 (1c) - (3c)
Second floor	26.2000 (1d)	x	2.4000 (2d)	=	62.8800 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	161.8000				(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	401.0600 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	1 * 20 = 20.0000 (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	5 * 10 = 50.0000 (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) =	70.0000 / (5) = 0.1745 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3745 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3184 (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	0.4059	0.3979	0.3900	0.3502	0.3422	0.3024	0.3024	0.2945	0.3184	0.3422	0.3582	0.3741 (22b)
Effective ac	0.5824	0.5792	0.5760	0.5613	0.5586	0.5457	0.5457	0.5434	0.5507	0.5586	0.5641	0.5700 (25)

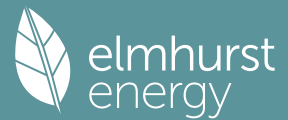
3. Heat losses and heat loss parameter

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							
Ent Door			1.9600	1.2000	2.3520		(26a)
Windows			25.2700	1.1450	28.9351		(27)
Rooflight			1.3700	1.1450	1.5687		(27a)
Heatloss Floor 1			71.9000	0.1200	8.6280	75.0000	5392.5000 (28a)
Brick	114.9000	17.9900	96.9100	0.2000	19.3820	60.0000	5814.6000 (29a)
Ashlar Wall	33.7500		33.7500	0.1600	5.4000	9.0000	303.7500 (29a)
Cladding	17.2800	9.2400	8.0400	0.1900	1.5276	60.0000	482.4000 (29a)
Planned Roof	26.2000		26.2000	0.0900	2.3580	9.0000	235.8000 (30)
Sloped Roof	51.2400	1.3700	49.8700	0.1481	7.3881	9.0000	448.8300 (30)
Flat Roof	8.2000		8.2000	0.1500	1.2300	9.0000	73.8000 (30)
Total net area of external elements Aum(A, m ²)			323.4700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	78.7696		(33)
Main dwelling							
Party Wall 1			62.4000	0.0000	0.0000	70.0000	4368.0000 (32)
Internal Wall 1			252.5200			9.0000	2272.6800 (32c)
Internal Floor 1			26.2000			18.0000	471.6000 (32d)
Internal Floor 2			63.7000			18.0000	1146.6000 (32d)
Internal Ceiling 1			63.7000			9.0000	573.3000 (32e)

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.9514 (42)
Hot water usage for mixer showers												
	73.7054	72.5978	70.9837	67.8955	65.6165	63.0749	61.6303	63.2322	64.9881	67.7169	70.8715	73.4230 (42a)
Hot water usage for baths												
	31.8190	31.3464	30.6810	29.4540	28.5352	27.5165	26.9662	27.6270	28.3465	29.4366	30.6888	31.7114 (42b)
Hot water usage for other uses												
	44.8555	43.2244	41.5933	39.9622	38.3310	36.6999	36.6999	38.3310	39.9622	41.5933	43.2244	44.8555 (42c)
Average daily hot water use (litres/day)												138.2329 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
	150.3799	147.1686	143.2579	137.3116	132.4827	127.2913	125.2964	129.1902	133.2967	138.7468	144.7847	149.9899 (44)
Energy content (annual)												
	238.1650	209.5661	220.1821	187.9728	178.3472	156.5196	151.5352	159.9645	164.3682	188.2781	206.2723	234.8480 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 2296.0190
	35.7247	31.4349	33.0273	28.1959	26.7521	23.4779	22.7303	23.9947	24.6552	28.2417	30.9409	35.2272 (46)
Water storage loss:												
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.1000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.5940 (55)
Total storage loss												
	18.4140	16.6320	18.4140	17.8200	18.4140	17.8200	18.4140	18.4140	17.8200	18.4140	17.8200	18.4140 (56)
If cylinder contains dedicated solar storage												
	18.4140	16.6320	18.4140	17.8200	18.4140	17.8200	18.4140	18.4140	17.8200	18.4140	17.8200	18.4140 (57)
Primary loss												23.2624 (59)
	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 (61)
	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												
	279.8414	247.2093	261.8585	228.3048	220.0236	196.8516	193.2116	201.6409	204.7002	229.9545	246.6043	276.5244 (62)
WWHRS												0.0000 (63a)
	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 (63b)
	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 (63c)
	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 (63d)
	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												
	279.8414	247.2093	261.8585	228.3048	220.0236	196.8516	193.2116	201.6409	204.7002	229.9545	246.6043	276.5244 (64)
Total per year (kWh/year) = Sum(64)m =												2786.7250 (64)
12Total per year (kWh/year)												2787 (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												
	112.5310	99.7953	106.5517	94.7665	92.6416	84.3084	83.7266	86.5293	86.9180	95.9436	100.8512	111.4281 (65)

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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					6.4800	10.6334	0.5100	0.0000	0.7700		27.0587 (74)	
Northeast					4.0600	11.2829	0.5100	0.0000	0.7700		17.9891 (75)	
South					14.7300	46.7521	0.5100	0.0000	0.7700		270.4360 (78)	
Northeast					1.3700	26.0000	0.6300	0.7000	1.0000		14.1376 (82)	
Solar gains	329.6214	560.5951	770.2238	968.6972	1104.6364	1107.0157	1062.8386	958.6861	837.9219	619.9057	394.5181	282.3487 (83)
Total gains	1055.1953	1305.5178	1482.5073	1656.6423	1756.2740	1735.0296	1665.7978	1561.9560	1460.1172	1263.0820	1078.0146	991.7434 (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	34.8995	34.9848	35.0688	35.4688	35.5447	35.9021	35.9021	35.9691	35.7636	35.5447	35.3916	35.2329
alpha	3.3266	3.3323	3.3379	3.3646	3.3696	3.3935	3.3935	3.3979	3.3842	3.3696	3.3594	3.3489
util living area	0.9777	0.9560	0.9211	0.8479	0.7303	0.5689	0.4295	0.4720	0.6800	0.8814	0.9605	0.9815 (86)
Living	19.4146	19.6753	19.9952	20.3761	20.6650	20.8340	20.8872	20.8789	20.7669	20.3782	19.8291	19.3723
Non living	18.1578	18.4880	18.8890	19.3602	19.6941	19.8757	19.9198	19.9162	19.8129	19.3747	18.6934	18.1102
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	20.1889	19.6753	19.9952	20.3761	20.6650	20.8340	20.8872	20.8789	20.7669	20.3782	19.8291	19.5999 (87)
Th 2	20.0226	20.0248	20.0269	20.0368	20.0387	20.0473	20.0473	20.0489	20.0440	20.0387	20.0349	20.0310 (88)
util rest of house	0.9736	0.9482	0.9071	0.8212	0.6841	0.4992	0.3429	0.3834	0.6141	0.8544	0.9523	0.9781 (89)
MIT 2	19.2792	18.4880	18.8890	19.3602	19.6941	19.8757	19.9198	19.9162	19.8129	19.3747	18.6934	18.4563 (90)
Living area fraction	19.4338	18.6898	19.0770	19.5329	19.8591	20.0386	20.0842	20.0798	19.9751	19.5452	18.8864	18.6507 (92)
MIT	19.4338	18.6898	19.0770	19.5329	19.8591	20.0386	20.0842	20.0798	19.9751	19.5452	18.8864	0.0000
Temperature adjustment	19.4338	18.6898	19.0770	19.5329	19.8591	20.0386	20.0842	20.0798	19.9751	19.5452	18.8864	18.6507 (93)
adjusted MIT	19.4338	18.6898	19.0770	19.5329	19.8591	20.0386	20.0842	20.0798	19.9751	19.5452	18.8864	18.6507 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9707	0.9347	0.8906	0.8051	0.6746	0.4986	0.3464	0.3864	0.6089	0.8378	0.9394	0.9718 (94)
Useful gains	1024.2648	1220.2556	1320.2519	1333.7871	1184.7955	865.0321	576.9678	603.5882	889.0930	1058.2671	1012.7043	963.7611 (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	2628.2990	2389.0420	2173.7100	1816.9756	1391.2823	918.1419	588.2061	620.0678	995.6762	1525.3266	2018.4993	2485.9179 (97)
Space heating kWh	1193.4014	785.4245	634.9728	347.8957	153.6261	0.0000	0.0000	0.0000	0.0000	347.4922	724.1724	1132.4847 (98a)
Space heating requirement - total per year (kWh/year)												5319.4699
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	1193.4014	785.4245	634.9728	347.8957	153.6261	0.0000	0.0000	0.0000	0.0000	347.4922	724.1724	1132.4847 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5319.4699
Space heating per m2										(98c) / (4) =		32.8768 (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 %)												283.6737 (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	1193.4014	785.4245	634.9728	347.8957	153.6261	0.0000	0.0000	0.0000	0.0000	347.4922	724.1724	1132.4847 (98)
Space heating efficiency (main heating system 1)	283.6737	283.6737	283.6737	283.6737	283.6737	0.0000	0.0000	0.0000	0.0000	283.6737	283.6737	283.6737 (210)
Space heating fuel (main heating system)	420.6951	276.8760	223.8391	122.6394	54.1559	0.0000	0.0000	0.0000	0.0000	122.4971	255.2836	399.2208 (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	279.8414	247.2093	261.8585	228.3048	220.0236	196.8516	193.2116	201.6409	204.7002	229.9545	246.6043	276.5244 (64)
Efficiency of water heater (217)m	177.3044	177.3044	177.3044	177.3044	177.3044	177.3044	177.3044	177.3044	177.3044	177.3044	177.3044	177.3044 (217)
Fuel for water heating, kWh/month	157.8310	139.4265	147.6887	128.7643	124.0937	111.0246	108.9717	113.7258	115.4513	129.6947	139.0853	155.9602 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	45.4991	36.5011	32.8652	24.0784	18.5989	15.1954	16.9665	22.0537	28.6456	37.5846	42.4517	46.7636 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												

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(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												1875.2070	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												177.3044	
Water heating fuel used												1571.7179	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												367.2036	(232)
Energy saving/generation technologies (Appendices M, N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												3814.1285	(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 (high-rate cost)	1500.1656	0.1634	245.1842	(261)
Space heating - main system 1 (low-rate cost)	375.0414	0.1372	51.4584	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating - high rate cost	1100.2025	0.1480	162.8525	(264)
Water heating - low rate cost	471.5154	0.1242	58.5765	(264)
Space and water heating			518.0716	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	367.2036	0.1490	54.7206	(268)
Total CO2, kg/year			572.7922	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.5400	(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 (high-rate cost)	1500.1656	1.2874	2414.1316	(275)
Space heating - main system 1 (low-rate cost)	375.0414	1.4967	561.3110	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating - high rate cost	1100.2025	1.5533	1708.9348	(278)
Water heating - low rate cost	471.5154	1.4446	681.1569	(278)
Space and water heating			5365.5343	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	367.2036	1.5547	570.9079	(282)
Total Primary energy kWh/year			5936.4422	(286)
Dwelling Primary energy Rate (DPER)			36.6900	(287)

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

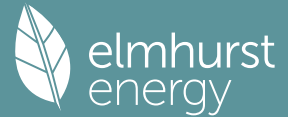
1. Overall dwelling characteristics

		Area	Storey height	Volume
		(m2)	(m)	(m3)
Main dwelling				
Ground floor		71.9000 (1b)	x 2.4000 (2b)	= 172.5600 (1b) - (3b)
First floor		63.7000 (1c)	x 2.6000 (2c)	= 165.6200 (1c) - (3c)
Second floor		26.2000 (1d)	x 2.4000 (2d)	= 62.8800 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	161.8000			(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e) ... (3n) =	401.0600 (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) = 0.0997 (8)

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Pressure test
Pressure Test Method
Measured/design AP50
Infiltration rate
Number of sides sheltered
Shelter factor
Infiltration rate adjusted to include shelter factor

Yes
Blower Door
5.0000 (17)
0.3497 (18)
2 (19)

(20) = 1 - [0.075 x (19)] = 0.8500 (20)
(21) = (18) x (20) = 0.2973 (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	0.3790	0.3716	0.3642	0.3270	0.3196	0.2824	0.2824	0.2750	0.2973	0.3196	0.3344	0.3493 (22b)
	0.5718	0.5690	0.5663	0.5535	0.5511	0.5399	0.5399	0.5378	0.5442	0.5511	0.5559	0.5610 (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 Semi-glazed door			1.9600	1.0000	1.9600		(26a)
TER Opening Type			25.2700	1.1450	28.9351		(27)
TER Roof Window			1.3700	1.1450	2.1807		(27a)
Heatloss Floor 1			71.9000	0.1300	9.3470		(28a)
Brick	114.9000	17.9900	96.9100	0.1800	17.4438		(29a)
Ashlar Wall	33.7500		33.7500	0.1800	6.0750		(29a)
Cladding	17.2800	9.2400	8.0400	0.1800	1.4472		(29a)
Planned Roof	26.2000		26.2000	0.1100	2.8820		(30)
Sloped Roof	51.2400	1.3700	49.8700	0.1100	5.4857		(30)
Flat Roof	8.2000		8.2000	0.1100	0.9020		(30)
Total net area of external elements Aum(A, m2)			323.4700				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 76.6585		(33)
Main dwelling							
Party Wall 1			62.4000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							134.8557 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	32.4000	0.0900	2.9160
P1 Party wall - Ground floor	10.9000	0.0800	0.8720
E2 Other lintels (including other steel lintels)	17.4900	0.0500	0.8745
E3 Sill	16.5600	0.0500	0.8280
E4 Jamb	34.5000	0.0500	1.7250
E5 Ground floor (normal)	25.1000	0.1600	4.0160
E6 Intermediate floor within a dwelling	22.9300	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	9.3000	-0.0900	-0.8370
E18 Party wall between dwellings	9.8000	0.0600	0.5880
R1 Head of roof window	1.4000	0.0800	0.1120
R2 Sill of roof window	1.4000	0.0600	0.0840
R3 Jamb of roof window	1.9600	0.0800	0.1568
P2 Party wall - Intermediate floor within a dwelling	9.6000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	4.7000	0.1200	0.5640
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000
E12 Gable (insulation at ceiling level)	10.0000	0.0600	0.6000
E14 Flat roof	7.2000	0.0800	0.5760
E10 Eaves (insulation at ceiling level)	11.0000	0.0600	0.6600
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			14.0353 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 90.6938 (37)

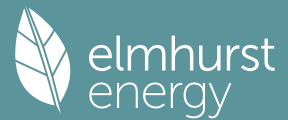
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	75.6816	75.3125	74.9506	73.2510	72.9331	71.4528	71.4528	71.1786	72.0230	72.9331	73.5763	74.2489 (38)
Average = Sum(39)m / 12 =	166.3755	166.0063	165.6445	163.9449	163.6269	162.1466	162.1466	161.8725	162.7168	163.6269	164.2702	164.9427 (39)
												163.9433
HLP	1.0283	1.0260	1.0238	1.0133	1.0113	1.0021	1.0021	1.0004	1.0057	1.0113	1.0153	1.0194 (40)
HLP (average)												1.0132
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9514 (42)
Hot water usage for mixer showers												
73.7054	72.5978	70.9837	67.8955	65.6165	63.0749	61.6303	63.2322	64.9881	67.7169	70.8715	73.4230 (42a)	
Hot water usage for baths												
31.8190	31.3464	30.6810	29.4540	28.5352	27.5165	26.9662	27.6270	28.3465	29.4366	30.6888	31.7114 (42b)	
Hot water usage for other uses												
44.8555	43.2244	41.5933	39.9622	38.3310	36.6999	36.6999	38.3310	39.9622	41.5933	43.2244	44.8555 (42c)	
Average daily hot water use (litres/day)												138.2329 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
150.3799	147.1686	143.2579	137.3116	132.4827	127.2913	125.2964	129.1902	133.2967	138.7468	144.7847	149.9899 (44)	
Energy content (annual)	238.1650	209.5661	220.1821	187.9728	178.3472	156.5196	151.5352	159.9645	164.3682	188.2781	206.2723	234.8480 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2296.0190
35.7247	31.4349	33.0273	28.1959	26.7521	23.4779	22.7303	23.9947	24.6552	28.2417	30.9409	35.2272 (46)	
Water storage loss:												
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8903 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0208 (55)
Total storage loss												
31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444 (56)	
If cylinder contains dedicated solar storage												
31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444 (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												
293.0718	259.1593	275.0889	241.1084	233.2540	209.6552	206.4420	214.8712	217.5038	243.1849	259.4079	289.7548 (62)	

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WVHRS	-33.6950	-29.8002	-31.2050	-25.8390	-24.0810	-20.6063	-19.3151	-20.5397	-21.3201	-25.1340	-28.4738	-33.0711 (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	259.3767	229.3591	243.8839	215.2694	209.1730	189.0489	187.1269	194.3316	196.1837	218.0509	230.9342	256.6837 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											2629.4219 (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)
Heat gains from water heating, kWh/month	123.1153	109.3553	117.1360	105.0094	103.2259	94.5512	94.3109	97.1136	97.1609	106.5279	111.0940	122.0124 (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	147.5709	147.5709	147.5709	147.5709	147.5709	147.5709	147.5709	147.5709	147.5709	147.5709	147.5709	147.5709	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	173.9622	192.6010	173.9622	179.7609	173.9622	179.7609	173.9622	173.9622	179.7609	173.9622	179.7609	173.9622	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	333.0891	336.5456	327.8355	309.2928	285.8859	263.8868	249.1900	245.7336	254.4437	272.9864	296.3932	318.3924	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7571	37.7571	37.7571	37.7571	37.7571	37.7571	37.7571	37.7571	37.7571	37.7571	37.7571	37.7571	(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)	-118.0568	-118.0568	-118.0568	-118.0568	-118.0568	-118.0568	-118.0568	-118.0568	-118.0568	-118.0568	-118.0568	-118.0568	(71)
Water heating gains (Table 5)	165.4775	162.7311	157.4408	145.8464	138.7445	131.3212	126.7619	130.5291	134.9457	143.1827	154.2973	163.9951	(72)
Total internal gains	742.8002	762.1490	729.5098	705.1714	668.8639	642.2402	617.1854	617.4961	636.4216	660.4025	700.7227	726.6210	(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				6.4800	10.6334		0.6300		0.7000		0.7700		21.0581 (74)
Northeast				4.0600	11.2829		0.6300		0.7000		0.7700		13.9997 (75)
South				14.7300	46.7521		0.6300		0.7000		0.7700		210.4628 (78)
Northeast				1.3700	26.0000		0.6300		0.7000		1.0000		14.1376 (82)
Solar gains	259.6582	442.7865	610.9915	771.9621	882.8194	885.6357	849.9291	765.0153	665.9677	490.3911	311.0072		222.2660 (83)
Total gains	1002.4584	1204.9354	1340.5013	1477.1335	1551.6832	1527.8759	1467.1145	1382.5114	1302.3892	1150.7936	1011.7299		948.8870 (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	36.4298	36.5108	36.5905	36.9698	37.0417	37.3799	37.3799	37.4432	37.2489	37.0417	36.8966	36.7462
alpha	3.4287	3.4341	3.4394	3.4647	3.4694	3.4920	3.4920	3.4962	3.4833	3.4694	3.4598	3.4497
util living area	0.9804	0.9633	0.9357	0.8744	0.7686	0.6107	0.4653	0.5081	0.7162	0.8991	0.9658	0.9836 (86)
MIT	19.0615	19.3667	19.7596	20.2495	20.6430	20.8862	20.9665	20.9542	20.7935	20.2763	19.5844	19.0109 (87)
Th 2	20.0598	20.0617	20.0636	20.0723	20.0739	20.0815	20.0815	20.0830	20.0786	20.0739	20.0706	20.0672 (88)
util rest of house	0.9768	0.9568	0.9240	0.8512	0.7257	0.5415	0.3762	0.4180	0.6532	0.8755	0.9586	0.9805 (89)
MIT 2	17.7841	18.1709	18.6653	19.2732	19.7341	19.9958	20.0640	20.0574	19.9083	19.3184	18.4563	17.7245 (90)
Living area fraction	18.0013	18.3742	18.8513	19.4391	19.8886	20.1471	20.2174	20.2098	20.0588	19.4812	18.6481	17.9431 (91)
Temperature adjustment	18.0013	18.3742	18.8513	19.4391	19.8886	20.1471	20.2174	20.2098	20.0588	19.4812	18.6481	17.9431 (92)
adjusted MIT	18.0013	18.3742	18.8513	19.4391	19.8886	20.1471	20.2174	20.2098	20.0588	19.4812	18.6481	17.9431 (93)

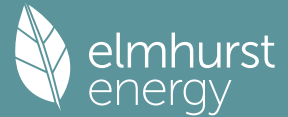
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9656	0.9411	0.9049	0.8325	0.7162	0.5467	0.3899	0.4310	0.6517	0.8570	0.9436	0.9706 (94)
Ext temp.	967.9655	1133.9358	1213.0269	1229.7856	1111.3816	835.3566	571.9871	595.8329	848.7657	986.1854	954.6226	920.9557 (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	2279.5523	2236.7975	2045.9277	1727.8316	1339.8741	899.4417	586.5542	616.6992	969.5898	1453.1981	1897.0041	2266.8285 (97)
Space heating requirement - total per year (kWh/year)	975.8205	741.1231	619.6782	358.5931	169.9984	0.0000	0.0000	0.0000	0.0000	347.4574	678.5147	1001.3294 (98a)
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)
Space heating contribution - total per year (kWh/year)	975.8205	741.1231	619.6782	358.5931	169.9984	0.0000	0.0000	0.0000	0.0000	347.4574	678.5147	1001.3294 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	(98c) / (4) =											4892.5148 (99)
Space heating per m2												30.2380 (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)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	975.8205	741.1231	619.6782	358.5931	169.9984	0.0000	0.0000	0.0000	0.0000	347.4574	678.5147	1001.3294	(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)	1057.2270	802.9503	671.3740	388.5083	184.1803	0.0000	0.0000	0.0000	0.0000	376.4435	735.1188	1084.8639	(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	259.3767	229.3591	243.8839	215.2694	209.1730	189.0489	187.1269	194.3316	196.1837	218.0509	230.9342	256.6837	(64)
Efficiency of water heater (217)m	86.7456	86.4945	86.0589	85.1956	83.5987	79.8000	79.8000	79.8000	79.8000	85.0993	86.3277	79.8000	(216)
Fuel for water heating, kWh/month	299.0085	265.1718	283.3918	252.6766	250.2108	236.9033	234.4948	243.5233	245.8443	256.2311	267.5087	295.7100	(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	36.1459	28.9976	26.1091	19.1287	14.7755	12.0717	13.4787	17.5202	22.7570	29.8584	33.7249	37.1505	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-63.9028	-88.4148	-124.7021	-137.4109	-145.7371	-135.0204	-133.1947	-126.8311	-115.3870	-99.6172	-69.5917	-55.4329	(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	-41.3729	-86.3773	-170.5474	-254.5900	-335.2268	-336.4518	-332.6373	-282.4080	-207.9175	-123.1776	-55.1085	-32.7797	(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												5300.6661	(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												3130.6749	(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)												291.7182	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3553.8376	(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												5255.2216	(238)

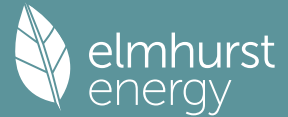
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	5300.6661	0.2100	1113.1399	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3130.6749	0.2100	657.4417	(264)
Space and water heating			1770.5816	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	291.7182	0.1443	42.1039	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1295.2428	0.1350	-174.8902	
PV Unit electricity exported	-2258.5949	0.1261	-284.7339	
Total			-459.6242	(269)
Total CO2, kg/year			1364.9907	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.4400	(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	5300.6661	1.1300	5989.7527	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3130.6749	1.1300	3537.6627	(278)
Space and water heating			9527.4154	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	291.7182	1.5338	447.4471	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1295.2428	1.4991	-1941.6394	
PV Unit electricity exported	-2258.5949	0.4628	-1045.1849	
Total			-2986.8243	(283)
Total Primary energy kWh/year			7118.1390	(286)
Target Primary Energy Rate (TPER)			43.9900	(287)

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Property Reference	P5 Ladds				Issued on Date	21/08/2025
Assessment Reference	Semi		Prop Type Ref	Semi		
Property	1, Bath Road, Hare Hatch, Berkshire, RG10 9SA					
SAP Rating	82 B	DER	3.54	TER	8.44	
Environmental	96 A	% DER < TER				58.06
CO ₂ Emissions (t/year)	0.51	DFEE	34.67	TFEE	35.35	
Compliance Check	See BREL	% DFEE < TFEE				1.92
% DPER < TPER	16.59	DPER	36.69	TPER	43.99	
Assessor Details	Mrs. Rebecca Lennon				Assessor ID	P627-0001
Client						

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	71.9000 (1b)	x 2.4000 (2b)	= 172.5600 (1b) - (3b)
First floor	63.7000 (1c)	x 2.6000 (2c)	= 165.6200 (1c) - (3c)
Second floor	26.2000 (1d)	x 2.4000 (2d)	= 62.8800 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	161.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	401.0600 (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	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) =	0.0997 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000	(17)
Infiltration rate	0.2997	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2548 (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	0.3248	0.3185	0.3121	0.2803	0.2739	0.2420	0.2420	0.2357	0.2548	0.2739	0.2866	0.2994 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5528	0.5507	0.5487	0.5393	0.5375	0.5293	0.5293	0.5278	0.5325	0.5375	0.5411	0.5448 (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							
Ent Door			1.9600	1.2000	2.3520		(26a)
Windows			25.2700	1.1450	28.9351		(27)
Rooflight			1.3700	1.1450	1.5687		(27a)
Heatloss Floor 1			71.9000	0.1200	8.6280	75.0000	5392.5000 (28a)
Brick	114.9000	17.9900	96.9100	0.2000	19.3820	60.0000	5814.6000 (29a)
Ashlar Wall	33.7500		33.7500	0.1600	5.4000	9.0000	303.7500 (29a)
Cladding	17.2800	9.2400	8.0400	0.1900	1.5276	60.0000	482.4000 (29a)
Planned Roof	26.2000		26.2000	0.0900	2.3580	9.0000	235.8000 (30)
Sloped Roof	51.2400	1.3700	49.8700	0.1481	7.3881	9.0000	448.8300 (30)
Flat Roof	8.2000		8.2000	0.1500	1.2300	9.0000	73.8000 (30)
Total net area of external elements Aum(A, m ²)			323.4700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		78.7696		(33)
Main dwelling							
Party Wall 1			62.4000	0.0000	0.0000	70.0000	4368.0000 (32)
Internal Wall 1			252.5200			9.0000	2272.6800 (32c)
Internal Floor 1			26.2000			18.0000	471.6000 (32d)

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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	6.4800		10.6334		0.5100	0.0000	0.7700	27.0587	(74)
Northeast	4.0600		11.2829		0.5100	0.0000	0.7700	17.9891	(75)
South	14.7300		46.7521		0.5100	0.0000	0.7700	270.4360	(78)
Northeast	1.3700		26.0000		0.6300	0.7000	1.0000	14.1376	(82)
Solar gains	329.6214	560.5951	770.2238	968.6972	1104.6364	1107.0157	1062.8386	958.6861	837.9219
Total gains	958.4616	1210.1573	1390.3174	1572.0974	1676.2264	1659.7318	1593.7468	1487.7404	1383.2868
								619.9057	394.5181
								988.5881	282.3487 (83)
									896.0499 (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	35.7055	35.7626	35.8188	36.0850	36.1352	36.3710	36.3710	36.4150	36.2798	36.1352	36.0337	35.9282
alpha	3.3804	3.3842	3.3879	3.4057	3.4090	3.4247	3.4247	3.4277	3.4187	3.4090	3.4022	3.3952
util living area	0.9829	0.9634	0.9310	0.8606	0.7446	0.5838	0.4421	0.4876	0.6987	0.8959	0.9684	0.9862 (86)
MIT	18.9693	19.3226	19.7552	20.2686	20.6643	20.8947	20.9691	20.9566	20.7992	20.2609	19.5145	18.9034 (87)
Th 2	20.0426	20.0440	20.0453	20.0517	20.0529	20.0585	20.0585	20.0595	20.0563	20.0529	20.0505	20.0480 (88)
util rest of house	0.9797	0.9569	0.9186	0.8355	0.6996	0.5141	0.3545	0.3979	0.6340	0.8715	0.9617	0.9836 (89)
MIT 2	18.1830	18.5320	18.9554	19.4493	19.8069	19.9977	20.0461	20.0409	19.9290	19.4538	18.7297	18.1215 (90)
Living area fraction	18.3166	18.6664	19.0913	19.5885	19.9527	20.1501	20.2030	20.1966	20.0769	19.5909	18.8631	18.2544 (92)
MIT	18.3166	18.6664	19.0913	19.5885	19.9527	20.1501	20.2030	20.1966	20.0769	19.5909	18.8631	18.2544 (93)
Temperature adjustment												0.0000
adjusted MIT	18.3166	18.6664	19.0913	19.5885	19.9527	20.1501	20.2030	20.1966	20.0769	19.5909	18.8631	18.2544 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9719	0.9447	0.9033	0.8214	0.6944	0.5212	0.3683	0.4115	0.6355	0.8571	0.9505	0.9768 (94)
Useful gains	931.4840	1143.2299	1255.9260	1291.2752	1163.9225	865.1200	587.0234	612.1518	879.0862	1012.2407	939.6067	875.2786 (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	2379.3312	2333.1115	2130.6196	1795.3020	1384.2325	924.8939	600.4196	631.9114	998.5151	1508.0630	1978.5933	2370.9486 (97)
Space heating kWh	1077.1983	799.6004	650.7720	362.8993	163.9107	0.0000	0.0000	0.0000	0.0000	368.8918	748.0703	1112.7785 (98a)
Space heating requirement - total per year (kWh/year)												5284.1213
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	1077.1983	799.6004	650.7720	362.8993	163.9107	0.0000	0.0000	0.0000	0.0000	368.8918	748.0703	1112.7785 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5284.1213
Space heating per m2										(98c) / (4) =		32.6584 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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	0.0000	0.0000	0.0000	0.0000	0.0000	1566.4557	1233.1673	1264.9658	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8320	0.8895	0.8645	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1303.3392	1096.9423	1093.5527	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1841.1213	1768.4735	1651.0495	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	387.2031	499.6192	414.7777	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	96.8008	124.9048	103.6944	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												325.4000 (107)
Energy for space heating												32.6584 (99)
Energy for space cooling												2.0111 (108)
Total												34.6695 (109)
Fabric Energy Efficiency (DFEE)												34.7 (109)

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

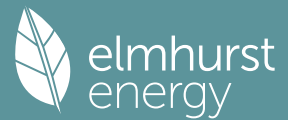
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	71.9000 (1b)	x 2.4000 (2b)	= 172.5600 (1b) - (3b)
First floor	63.7000 (1c)	x 2.6000 (2c)	= 165.6200 (1c) - (3c)
Second floor	26.2000 (1d)	x 2.4000 (2d)	= 62.8800 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	161.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	401.0600 (5)

Assumed occupancy											2.9514 (42)
Hot water usage for mixer showers											
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths											
31.8190	31.3464	30.6810	29.4540	28.5352	27.5165	26.9662	27.6270	28.3465	29.4366	30.6888	31.7114 (42b)
Hot water usage for other uses											

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Average daily hot water use (litres/day)	44.8555	43.2244	41.5933	39.9622	38.3310	36.6999	36.6999	38.3310	39.9622	41.5933	43.2244	44.8555 (42c) 70.2789 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	76.6745	74.5708	72.2742	69.4161	66.8663	64.2164	63.6661	65.9580	68.3086	71.0298	73.9132	76.5669 (44)
Energy content (annual)	121.4336	106.1878	111.0828	95.0272	90.0148	78.9616	76.9987	81.6698	84.2314	96.3868	105.3029	119.8852 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	103.2185	90.2596	94.4204	80.7731	76.5126	67.1173	65.4489	69.4194	71.5967	81.9288	89.5075	101.9024 (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	103.2185	90.2596	94.4204	80.7731	76.5126	67.1173	65.4489	69.4194	71.5967	81.9288	89.5075	101.9024 (64)
12Total per year (kWh/year)												992 (64)
Electric shower(s)	59.0258	52.5925	57.4289	54.8037	55.8321	53.2584	55.0337	55.8321	54.8037	57.4289	56.3491	59.0258 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												671.4147 (64a)
Heat gains from water heating, kWh/month	40.5611	35.7130	37.9623	33.8942	33.0862	30.0939	30.1206	31.3129	31.6001	34.8394	36.4641	40.2321 (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	147.5709	147.5709	147.5709	147.5709	147.5709	147.5709	147.5709	147.5709	147.5709	147.5709	147.5709	147.5709 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	173.9622	192.6010	173.9622	179.7609	173.9622	179.7609	173.9622	173.9622	179.7609	173.9622	179.7609	173.9622 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	333.0891	336.5456	327.8355	309.2928	285.8859	263.8868	249.1900	245.7336	254.4437	272.9864	296.3932	318.3924 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7571	37.7571	37.7571	37.7571	37.7571	37.7571	37.7571	37.7571	37.7571	37.7571	37.7571	37.7571 (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)	-118.0568	-118.0568	-118.0568	-118.0568	-118.0568	-118.0568	-118.0568	-118.0568	-118.0568	-118.0568	-118.0568	-118.0568 (71)
Water heating gains (Table 5)	54.5176	53.1444	51.0246	47.0753	44.4707	41.7971	40.4847	42.0872	43.8890	46.8272	50.6446	54.0753 (72)
Total internal gains	628.8402	649.5622	620.0936	603.4003	571.5901	552.7161	530.9082	529.0542	545.3649	561.0470	594.0701	613.7012 (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						6.4800	10.6334	0.6300	0.7000	0.7700		21.0581 (74)
Northeast						4.0600	11.2829	0.6300	0.7000	0.7700		13.9997 (75)
South						14.7300	46.7521	0.6300	0.7000	0.7700		210.4628 (78)
Northeast						1.3700	26.0000	0.6300	0.7000	1.0000		14.1376 (82)

Solar gains	259.6582	442.7865	610.9915	771.9621	882.8194	885.6357	849.9291	765.0153	665.9677	490.3911	311.0072	222.2660 (83)
Total gains	888.4984	1092.3487	1231.0851	1375.3624	1454.4094	1438.3519	1380.8373	1294.0695	1211.3326	1051.4382	905.0773	835.9672 (84)

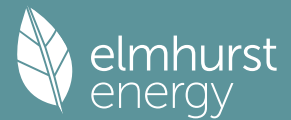
7. Mean internal temperature (heating season)

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	36.4298	36.5108	36.5905	36.9698	37.0417	37.3799	37.3799	37.4432	37.2489	37.0417	36.8966	36.7462
alpha	3.4287	3.4341	3.4394	3.4647	3.4694	3.4920	3.4920	3.4962	3.4833	3.4694	3.4598	3.4497
util living area	0.9863	0.9721	0.9484	0.8929	0.7935	0.6379	0.4904	0.5368	0.7466	0.9186	0.9750	0.9888 (86)
MIT	18.9466	19.2599	19.6658	20.1806	20.6011	20.8693	20.9606	20.9456	20.7626	20.2016	19.4819	18.8954 (87)
Th 2	20.0598	20.0617	20.0636	20.0723	20.0739	20.0815	20.0815	20.0830	20.0786	20.0739	20.0706	20.0672 (88)
util rest of house	0.9837	0.9670	0.9387	0.8721	0.7526	0.5683	0.3980	0.4436	0.6854	0.8984	0.9696	0.9866 (89)
MIT 2	18.1728	18.4838	18.8841	19.3868	19.7748	20.0038	20.0653	20.0589	19.9236	19.4169	18.7126	18.1272 (90)
Living area fraction									fLA = Living area / (4) =			0.1700 (91)
MIT	18.3043	18.6157	19.0169	19.5217	19.9153	20.1509	20.2174	20.2096	20.0662	19.5503	18.8434	18.2577 (92)
Temperature adjustment												0.0000
adjusted MIT	18.3043	18.6157	19.0169	19.5217	19.9153	20.1509	20.2174	20.2096	20.0662	19.5503	18.8434	18.2577 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9770	0.9566	0.9249	0.8575	0.7448	0.5739	0.4122	0.4572	0.6845	0.8844	0.9599	0.9809 (94)
Useful gains	868.0493	1044.8999	1138.6910	1179.3795	1083.1739	825.4400	569.2152	591.5970	829.1216	929.8514	868.7988	819.9632 (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	2329.9723	2276.8999	2073.3602	1741.3700	1344.2395	900.0605	586.5566	616.6751	970.8072	1464.5070	1929.0822	2318.7222 (97)
Space heating kWh	1087.6707	827.9040	695.3939	404.6332	194.2328	0.0000	0.0000	0.0000	0.0000	397.7838	763.4041	1115.0767 (98a)
Space heating requirement - total per year (kWh/year)												5486.0991

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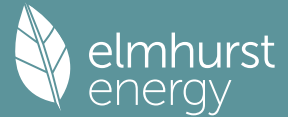
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	1087.6707	827.9040	695.3939	404.6332	194.2328	0.0000	0.0000	0.0000	0.0000	397.7838	763.4041	1115.0767 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5486.0991
Space heating per m2										(98c) / (4) =		33.9067 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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	0.0000	0.0000	0.0000	0.0000	0.0000	1524.1780	1199.8848	1230.2307	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7917	0.8590	0.8308	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1206.7095	1030.6884	1022.1310	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1582.3655	1519.6182	1424.6810	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	270.4723	363.7638	299.4972	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	67.6181	90.9409	74.8743	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												233.4333 (107)
Energy for space heating												33.9067 (99)
Energy for space cooling												1.4427 (108)
Total												35.3494 (109)
Fabric Energy Efficiency (TFEE)												35.3 (109)

Full SAP Calculation Printout



Property Reference	P5 Ladds				Issued on Date	21/08/2025
Assessment Reference	Semi			Prop Type Ref	Semi	
Property	1, Bath Road, Hare Hatch, Berkshire, RG10 9SA					
SAP Rating	82 B	DER	3.54	TER	8.44	
Environmental	96 A	% DER < TER				58.06
CO ₂ Emissions (t/year)	0.51	DFEE	34.67	TFEE	35.35	
Compliance Check	See BREL	% DFEE < TFEE				1.92
% DPER < TPER	16.59	DPER	36.69	TPER	43.99	
Assessor Details	Mrs. Rebecca Lennon				Assessor ID	P627-0001
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	71.9000 (1b)	x	2.4000 (2b)	=	172.5600 (1b) - (3b)
First floor	63.7000 (1c)	x	2.6000 (2c)	=	165.6200 (1c) - (3c)
Second floor	26.2000 (1d)	x	2.4000 (2d)	=	62.8800 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	161.8000				(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	401.0600 (5)

2. Ventilation rate

		m ³ per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	1 * 20 =	20.0000 (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	5 * 10 =	50.0000 (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) =	70.0000 / (5) =	0.1745 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000	(17)
Infiltration rate	0.3745	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3184 (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	0.4059	0.3979	0.3900	0.3502	0.3422	0.3024	0.3024	0.2945	0.3184	0.3422	0.3582	0.3741 (22b)
Effective ac	0.5824	0.5792	0.5760	0.5613	0.5586	0.5457	0.5457	0.5434	0.5507	0.5586	0.5641	0.5700 (25)

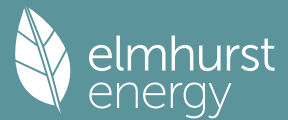
3. Heat losses and heat loss parameter

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							
Ent Door			1.9600	1.2000	2.3520		(26a)
Windows			25.2700	1.1450	28.9351		(27)
Rooflight			1.3700	1.1450	1.5687		(27a)
Heatloss Floor 1			71.9000	0.1200	8.6280	75.0000	5392.5000 (28a)
Brick	114.9000	17.9900	96.9100	0.2000	19.3820	60.0000	5814.6000 (29a)
Ashlar Wall	33.7500		33.7500	0.1600	5.4000	9.0000	303.7500 (29a)
Cladding	17.2800	9.2400	8.0400	0.1900	1.5276	60.0000	482.4000 (29a)
Planned Roof	26.2000		26.2000	0.0900	2.3580	9.0000	235.8000 (30)
Sloped Roof	51.2400	1.3700	49.8700	0.1481	7.3881	9.0000	448.8300 (30)
Flat Roof	8.2000		8.2000	0.1500	1.2300	9.0000	73.8000 (30)
Total net area of external elements Aum(A, m ²)			323.4700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	78.7696		(33)
Main dwelling							
Party Wall 1			62.4000	0.0000	0.0000	70.0000	4368.0000 (32)
Internal Wall 1			252.5200			9.0000	2272.6800 (32c)
Internal Floor 1			26.2000			18.0000	471.6000 (32d)
Internal Floor 2			63.7000			18.0000	1146.6000 (32d)
Internal Ceiling 1			63.7000			9.0000	573.3000 (32e)

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.9514 (42)
Hot water usage for mixer showers												
	73.7054	72.5978	70.9837	67.8955	65.6165	63.0749	61.6303	63.2322	64.9881	67.7169	70.8715	73.4230 (42a)
Hot water usage for baths												
	31.8190	31.3464	30.6810	29.4540	28.5352	27.5165	26.9662	27.6270	28.3465	29.4366	30.6888	31.7114 (42b)
Hot water usage for other uses												
	44.8555	43.2244	41.5933	39.9622	38.3310	36.6999	36.6999	38.3310	39.9622	41.5933	43.2244	44.8555 (42c)
Average daily hot water use (litres/day)												138.2329 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
	150.3799	147.1686	143.2579	137.3116	132.4827	127.2913	125.2964	129.1902	133.2967	138.7468	144.7847	149.9899 (44)
Energy content (annual)												
	238.1650	209.5661	220.1821	187.9728	178.3472	156.5196	151.5352	159.9645	164.3682	188.2781	206.2723	234.8480 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 2296.0190
	35.7247	31.4349	33.0273	28.1959	26.7521	23.4779	22.7303	23.9947	24.6552	28.2417	30.9409	35.2272 (46)
Water storage loss:												
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.1000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.5940 (55)
Total storage loss												
	18.4140	16.6320	18.4140	17.8200	18.4140	17.8200	18.4140	18.4140	17.8200	18.4140	17.8200	18.4140 (56)
If cylinder contains dedicated solar storage												
	18.4140	16.6320	18.4140	17.8200	18.4140	17.8200	18.4140	18.4140	17.8200	18.4140	17.8200	18.4140 (57)
Primary loss												23.2624 (59)
	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 (61)
	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												
	279.8414	247.2093	261.8585	228.3048	220.0236	196.8516	193.2116	201.6409	204.7002	229.9545	246.6043	276.5244 (62)
WWHRS												0.0000 (63a)
	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 (63b)
	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 (63c)
	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 (63d)
	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												
	279.8414	247.2093	261.8585	228.3048	220.0236	196.8516	193.2116	201.6409	204.7002	229.9545	246.6043	276.5244 (64)
Total per year (kWh/year) = Sum(64)m =												2786.7250 (64)
12Total per year (kWh/year)												2787 (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												
	112.5310	99.7953	106.5517	94.7665	92.6416	84.3084	83.7266	86.5293	86.9180	95.9436	100.8512	111.4281 (65)

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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					6.4800	10.6334	0.5100	0.0000	0.7700		27.0587 (74)	
Northeast					4.0600	11.2829	0.5100	0.0000	0.7700		17.9891 (75)	
South					14.7300	46.7521	0.5100	0.0000	0.7700		270.4360 (78)	
Northeast					1.3700	26.0000	0.6300	0.7000	1.0000		14.1376 (82)	
Solar gains	329.6214	560.5951	770.2238	968.6972	1104.6364	1107.0157	1062.8386	958.6861	837.9219	619.9057	394.5181	282.3487 (83)
Total gains	1055.1953	1305.5178	1482.5073	1656.6423	1756.2740	1735.0296	1665.7978	1561.9560	1460.1172	1263.0820	1078.0146	991.7434 (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	34.8995	34.9848	35.0688	35.4688	35.5447	35.9021	35.9021	35.9691	35.7636	35.5447	35.3916	35.2329
alpha	3.3266	3.3323	3.3379	3.3646	3.3696	3.3935	3.3935	3.3979	3.3842	3.3696	3.3594	3.3489
util living area	0.9777	0.9560	0.9211	0.8479	0.7303	0.5689	0.4295	0.4720	0.6800	0.8814	0.9605	0.9815 (86)
Living	19.4146	19.6753	19.9952	20.3761	20.6650	20.8340	20.8872	20.8789	20.7669	20.3782	19.8291	19.3723
Non living	18.1578	18.4880	18.8890	19.3602	19.6941	19.8757	19.9198	19.9162	19.8129	19.3747	18.6934	18.1102
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	20.1889	19.6753	19.9952	20.3761	20.6650	20.8340	20.8872	20.8789	20.7669	20.3782	19.8291	19.5999 (87)
Th 2	20.0226	20.0248	20.0269	20.0368	20.0387	20.0473	20.0473	20.0489	20.0440	20.0387	20.0349	20.0310 (88)
util rest of house	0.9736	0.9482	0.9071	0.8212	0.6841	0.4992	0.3429	0.3834	0.6141	0.8544	0.9523	0.9781 (89)
MIT 2	19.2792	18.4880	18.8890	19.3602	19.6941	19.8757	19.9198	19.9162	19.8129	19.3747	18.6934	18.4563 (90)
Living area fraction	19.4338	18.6898	19.0770	19.5329	19.8591	20.0386	20.0842	20.0798	19.9751	19.5452	18.8864	18.6507 (92)
MIT	19.4338	18.6898	19.0770	19.5329	19.8591	20.0386	20.0842	20.0798	19.9751	19.5452	18.8864	0.0000
Temperature adjustment	19.4338	18.6898	19.0770	19.5329	19.8591	20.0386	20.0842	20.0798	19.9751	19.5452	18.8864	18.6507 (93)
adjusted MIT	19.4338	18.6898	19.0770	19.5329	19.8591	20.0386	20.0842	20.0798	19.9751	19.5452	18.8864	18.6507 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9707	0.9347	0.8906	0.8051	0.6746	0.4986	0.3464	0.3864	0.6089	0.8378	0.9394	0.9718 (94)
Useful gains	1024.2648	1220.2556	1320.2519	1333.7871	1184.7955	865.0321	576.9678	603.5882	889.0930	1058.2671	1012.7043	963.7611 (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	2628.2990	2389.0420	2173.7100	1816.9756	1391.2823	918.1419	588.2061	620.0678	995.6762	1525.3266	2018.4993	2485.9179 (97)
Space heating kWh	1193.4014	785.4245	634.9728	347.8957	153.6261	0.0000	0.0000	0.0000	0.0000	347.4922	724.1724	1132.4847 (98a)
Space heating requirement - total per year (kWh/year)												5319.4699
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	1193.4014	785.4245	634.9728	347.8957	153.6261	0.0000	0.0000	0.0000	0.0000	347.4922	724.1724	1132.4847 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5319.4699
Space heating per m2										(98c) / (4) =		32.8768 (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 %)												283.6737 (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	1193.4014	785.4245	634.9728	347.8957	153.6261	0.0000	0.0000	0.0000	0.0000	347.4922	724.1724	1132.4847 (98)
Space heating efficiency (main heating system 1)	283.6737	283.6737	283.6737	283.6737	283.6737	0.0000	0.0000	0.0000	0.0000	283.6737	283.6737	283.6737 (210)
Space heating fuel (main heating system)	420.6951	276.8760	223.8391	122.6394	54.1559	0.0000	0.0000	0.0000	0.0000	122.4971	255.2836	399.2208 (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	279.8414	247.2093	261.8585	228.3048	220.0236	196.8516	193.2116	201.6409	204.7002	229.9545	246.6043	276.5244 (64)
Efficiency of water heater (217)m	177.3044	177.3044	177.3044	177.3044	177.3044	177.3044	177.3044	177.3044	177.3044	177.3044	177.3044	177.3044 (217)
Fuel for water heating, kWh/month	157.8310	139.4265	147.6887	128.7643	124.0937	111.0246	108.9717	113.7258	115.4513	129.6947	139.0853	155.9602 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	45.4991	36.5011	32.8652	24.0784	18.5989	15.1954	16.9665	22.0537	28.6456	37.5846	42.4517	46.7636 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												

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(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												1875.2070	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												177.3044	
Water heating fuel used												1571.7179	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												367.2036	(232)
Energy saving/generation technologies (Appendices M, N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												3814.1285	(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 (high-rate cost)	1500.1656	0.1634	245.1842	(261)
Space heating - main system 1 (low-rate cost)	375.0414	0.1372	51.4584	(261)
Total CO2 associated with community systems			0.0000	(273)
Water heating - high rate cost	1100.2025	0.1480	162.8525	(264)
Water heating - low rate cost	471.5154	0.1242	58.5765	(264)
Space and water heating			518.0716	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	367.2036	0.1490	54.7206	(268)
Total CO2, kg/year			572.7922	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.5400	(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 (high-rate cost)	1500.1656	1.2874	2414.1316	(275)
Space heating - main system 1 (low-rate cost)	375.0414	1.4967	561.3110	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating - high rate cost	1100.2025	1.5533	1708.9348	(278)
Water heating - low rate cost	471.5154	1.4446	681.1569	(278)
Space and water heating			5365.5343	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	367.2036	1.5547	570.9079	(282)
Total Primary energy kWh/year			5936.4422	(286)
Dwelling Primary energy Rate (DPER)			36.6900	(287)

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

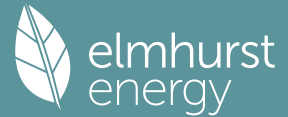
1. Overall dwelling characteristics

		Area	Storey height	Volume	
		(m2)	(m)	(m3)	
Main dwelling					
Ground floor		71.9000 (1b)	x 2.4000 (2b)	= 172.5600 (1b) - (3b)	
First floor		63.7000 (1c)	x 2.6000 (2c)	= 165.6200 (1c) - (3c)	
Second floor		26.2000 (1d)	x 2.4000 (2d)	= 62.8800 (1d) - (3d)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	161.8000				(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e) ... (3n) =	401.0600	(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)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0997 (8)

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Pressure test
Pressure Test Method
Measured/design AP50
Infiltration rate
Number of sides sheltered
Shelter factor
Infiltration rate adjusted to include shelter factor

Yes
Blower Door
5.0000 (17)
0.3497 (18)
2 (19)

(20) = 1 - [0.075 x (19)] = 0.8500 (20)
(21) = (18) x (20) = 0.2973 (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	0.3790	0.3716	0.3642	0.3270	0.3196	0.2824	0.2824	0.2750	0.2973	0.3196	0.3344	0.3493 (22b)
	0.5718	0.5690	0.5663	0.5535	0.5511	0.5399	0.5399	0.5378	0.5442	0.5511	0.5559	0.5610 (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 Semi-glazed door			1.9600	1.0000	1.9600		(26a)
TER Opening Type			25.2700	1.1450	28.9351		(27)
TER Roof Window			1.3700	1.1450	2.1807		(27a)
Heatloss Floor 1			71.9000	0.1300	9.3470		(28a)
Brick	114.9000	17.9900	96.9100	0.1800	17.4438		(29a)
Ashlar Wall	33.7500		33.7500	0.1800	6.0750		(29a)
Cladding	17.2800	9.2400	8.0400	0.1800	1.4472		(29a)
Planned Roof	26.2000		26.2000	0.1100	2.8820		(30)
Sloped Roof	51.2400	1.3700	49.8700	0.1100	5.4857		(30)
Flat Roof	8.2000		8.2000	0.1100	0.9020		(30)
Total net area of external elements Aum(A, m2)			323.4700				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 76.6585		(33)
Main dwelling							
Party Wall 1			62.4000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							134.8557 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	32.4000	0.0900	2.9160
P1 Party wall - Ground floor	10.9000	0.0800	0.8720
E2 Other lintels (including other steel lintels)	17.4900	0.0500	0.8745
E3 Sill	16.5600	0.0500	0.8280
E4 Jamb	34.5000	0.0500	1.7250
E5 Ground floor (normal)	25.1000	0.1600	4.0160
E6 Intermediate floor within a dwelling	22.9300	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	9.3000	-0.0900	-0.8370
E18 Party wall between dwellings	9.8000	0.0600	0.5880
R1 Head of roof window	1.4000	0.0800	0.1120
R2 Sill of roof window	1.4000	0.0600	0.0840
R3 Jamb of roof window	1.9600	0.0800	0.1568
P2 Party wall - Intermediate floor within a dwelling	9.6000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	4.7000	0.1200	0.5640
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000
E12 Gable (insulation at ceiling level)	10.0000	0.0600	0.6000
E14 Flat roof	7.2000	0.0800	0.5760
E10 Eaves (insulation at ceiling level)	11.0000	0.0600	0.6600
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			14.0353 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 90.6938 (37)

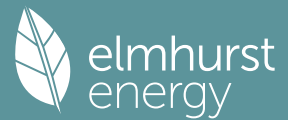
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	75.6816	75.3125	74.9506	73.2510	72.9331	71.4528	71.4528	71.1786	72.0230	72.9331	73.5763	74.2489 (38)
Average = Sum(39)m / 12 =	166.3755	166.0063	165.6445	163.9449	163.6269	162.1466	162.1466	161.8725	162.7168	163.6269	164.2702	164.9427 (39)
												163.9433
HLP	1.0283	1.0260	1.0238	1.0133	1.0113	1.0021	1.0021	1.0004	1.0057	1.0113	1.0153	1.0194 (40)
HLP (average)												1.0132
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9514 (42)
Hot water usage for mixer showers												
73.7054	72.5978	70.9837	67.8955	65.6165	63.0749	61.6303	63.2322	64.9881	67.7169	70.8715	73.4230 (42a)	
Hot water usage for baths												
31.8190	31.3464	30.6810	29.4540	28.5352	27.5165	26.9662	27.6270	28.3465	29.4366	30.6888	31.7114 (42b)	
Hot water usage for other uses												
44.8555	43.2244	41.5933	39.9622	38.3310	36.6999	36.6999	38.3310	39.9622	41.5933	43.2244	44.8555 (42c)	
Average daily hot water use (litres/day)												138.2329 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
150.3799	147.1686	143.2579	137.3116	132.4827	127.2913	125.2964	129.1902	133.2967	138.7468	144.7847	149.9899 (44)	
Energy content (annual)	238.1650	209.5661	220.1821	187.9728	178.3472	156.5196	151.5352	159.9645	164.3682	188.2781	206.2723	234.8480 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2296.0190
35.7247	31.4349	33.0273	28.1959	26.7521	23.4779	22.7303	23.9947	24.6552	28.2417	30.9409	35.2272 (46)	
Water storage loss:												
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8903 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0208 (55)
Total storage loss												
31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444 (56)	
If cylinder contains dedicated solar storage												
31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444 (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												
293.0718	259.1593	275.0889	241.1084	233.2540	209.6552	206.4420	214.8712	217.5038	243.1849	259.4079	289.7548 (62)	

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WWHRS	-33.6950	-29.8002	-31.2050	-25.8390	-24.0810	-20.6063	-19.3151	-20.5397	-21.3201	-25.1340	-28.4738	-33.0711 (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	259.3767	229.3591	243.8839	215.2694	209.1730	189.0489	187.1269	194.3316	196.1837	218.0509	230.9342	256.6837 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											2629.4219 (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)
Heat gains from water heating, kWh/month	123.1153	109.3553	117.1360	105.0094	103.2259	94.5512	94.3109	97.1136	97.1609	106.5279	111.0940	122.0124 (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	147.5709	147.5709	147.5709	147.5709	147.5709	147.5709	147.5709	147.5709	147.5709	147.5709	147.5709	147.5709	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	173.9622	192.6010	173.9622	179.7609	173.9622	179.7609	173.9622	173.9622	179.7609	173.9622	179.7609	173.9622	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	333.0891	336.5456	327.8355	309.2928	285.8859	263.8868	249.1900	245.7336	254.4437	272.9864	296.3932	318.3924	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7571	37.7571	37.7571	37.7571	37.7571	37.7571	37.7571	37.7571	37.7571	37.7571	37.7571	37.7571	(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)	-118.0568	-118.0568	-118.0568	-118.0568	-118.0568	-118.0568	-118.0568	-118.0568	-118.0568	-118.0568	-118.0568	-118.0568	(71)
Water heating gains (Table 5)	165.4775	162.7311	157.4408	145.8464	138.7445	131.3212	126.7619	130.5291	134.9457	143.1827	154.2973	163.9951	(72)
Total internal gains	742.8002	762.1490	729.5098	705.1714	668.8639	642.2402	617.1854	617.4961	636.4216	660.4025	700.7227	726.6210	(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				6.4800	10.6334		0.6300		0.7000		0.7700		21.0581 (74)
Northeast				4.0600	11.2829		0.6300		0.7000		0.7700		13.9997 (75)
South				14.7300	46.7521		0.6300		0.7000		0.7700		210.4628 (78)
Northeast				1.3700	26.0000		0.6300		0.7000		1.0000		14.1376 (82)
Solar gains	259.6582	442.7865	610.9915	771.9621	882.8194	885.6357	849.9291	765.0153	665.9677	490.3911	311.0072		222.2660 (83)
Total gains	1002.4584	1204.9354	1340.5013	1477.1335	1551.6832	1527.8759	1467.1145	1382.5114	1302.3892	1150.7936	1011.7299		948.8870 (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	36.4298	36.5108	36.5905	36.9698	37.0417	37.3799	37.3799	37.4432	37.2489	37.0417	36.8966	36.7462
alpha	3.4287	3.4341	3.4394	3.4647	3.4694	3.4920	3.4920	3.4962	3.4833	3.4694	3.4598	3.4497
util living area	0.9804	0.9633	0.9357	0.8744	0.7686	0.6107	0.4653	0.5081	0.7162	0.8991	0.9658	0.9836 (86)
MIT	19.0615	19.3667	19.7596	20.2495	20.6430	20.8862	20.9665	20.9542	20.7935	20.2763	19.5844	19.0109 (87)
Th 2	20.0598	20.0617	20.0636	20.0723	20.0739	20.0815	20.0815	20.0830	20.0786	20.0739	20.0706	20.0672 (88)
util rest of house	0.9768	0.9568	0.9240	0.8512	0.7257	0.5415	0.3762	0.4180	0.6532	0.8755	0.9586	0.9805 (89)
MIT 2	17.7841	18.1709	18.6653	19.2732	19.7341	19.9958	20.0640	20.0574	19.9083	19.3184	18.4563	17.7245 (90)
Living area fraction	18.0013	18.3742	18.8513	19.4391	19.8886	20.1471	20.2174	20.2098	20.0588	19.4812	18.6481	17.9431 (91)
MIT	18.0013	18.3742	18.8513	19.4391	19.8886	20.1471	20.2174	20.2098	20.0588	19.4812	18.6481	17.9431 (92)
Temperature adjustment	18.0013	18.3742	18.8513	19.4391	19.8886	20.1471	20.2174	20.2098	20.0588	19.4812	18.6481	17.9431 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9656	0.9411	0.9049	0.8325	0.7162	0.5467	0.3899	0.4310	0.6517	0.8570	0.9436	0.9706 (94)
Ext temp.	967.9655	1133.9358	1213.0269	1229.7856	1111.3816	835.3566	571.9871	595.8329	848.7657	986.1854	954.6226	920.9557 (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	2279.5523	2236.7975	2045.9277	1727.8316	1339.8741	899.4417	586.5542	616.6992	969.5898	1453.1981	1897.0041	2266.8285 (97)
Space heating requirement - total per year (kWh/year)	975.8205	741.1231	619.6782	358.5931	169.9984	0.0000	0.0000	0.0000	0.0000	347.4574	678.5147	1001.3294 (98a)
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)
Space heating contribution - total per year (kWh/year)	975.8205	741.1231	619.6782	358.5931	169.9984	0.0000	0.0000	0.0000	0.0000	347.4574	678.5147	1001.3294 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	975.8205	741.1231	619.6782	358.5931	169.9984	0.0000	0.0000	0.0000	0.0000	347.4574	678.5147	4892.5148 (99)
Space heating per m2	(98c) / (4) =											30.2380 (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)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	975.8205	741.1231	619.6782	358.5931	169.9984	0.0000	0.0000	0.0000	0.0000	347.4574	678.5147	1001.3294	(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)	1057.2270	802.9503	671.3740	388.5083	184.1803	0.0000	0.0000	0.0000	0.0000	376.4435	735.1188	1084.8639	(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	259.3767	229.3591	243.8839	215.2694	209.1730	189.0489	187.1269	194.3316	196.1837	218.0509	230.9342	256.6837	(64)
Efficiency of water heater (217)m	86.7456	86.4945	86.0589	85.1956	83.5987	79.8000	79.8000	79.8000	79.8000	85.0993	86.3277	79.8000	(216)
Fuel for water heating, kWh/month	299.0085	265.1718	283.3918	252.6766	250.2108	236.9033	234.4948	243.5233	245.8443	256.2311	267.5087	295.7100	(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	36.1459	28.9976	26.1091	19.1287	14.7755	12.0717	13.4787	17.5202	22.7570	29.8584	33.7249	37.1505	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-63.9028	-88.4148	-124.7021	-137.4109	-145.7371	-135.0204	-133.1947	-126.8311	-115.3870	-99.6172	-69.5917	-55.4329	(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	-41.3729	-86.3773	-170.5474	-254.5900	-335.2268	-336.4518	-332.6373	-282.4080	-207.9175	-123.1776	-55.1085	-32.7797	(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												5300.6661	(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												3130.6749	(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)												291.7182	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3553.8376	(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												5255.2216	(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	5300.6661	0.2100	1113.1399	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3130.6749	0.2100	657.4417	(264)
Space and water heating			1770.5816	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	291.7182	0.1443	42.1039	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1295.2428	0.1350	-174.8902	
PV Unit electricity exported	-2258.5949	0.1261	-284.7339	
Total			-459.6242	(269)
Total CO2, kg/year			1364.9907	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.4400	(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	5300.6661	1.1300	5989.7527	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3130.6749	1.1300	3537.6627	(278)
Space and water heating			9527.4154	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	291.7182	1.5338	447.4471	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1295.2428	1.4991	-1941.6394	
PV Unit electricity exported	-2258.5949	0.4628	-1045.1849	
Total			-2986.8243	(283)
Total Primary energy kWh/year			7118.1390	(286)
Target Primary Energy Rate (TPER)			43.9900	(287)

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Property Reference	P7 Ladds			Issued on Date	21/08/2025
Assessment Reference	Detached	Prop Type Ref	Semi		
Property	1, Bath Road, Hare Hatch, Berkshire, RG10 9SA				
SAP Rating	81 B	DER	3.59	TER	8.53
Environmental	96 A	% DER < TER			57.91
CO ₂ Emissions (t/year)	0.53	DFEE	36.28	TFEE	39.50
Compliance Check	See BREL	% DFEE < TFEE			8.14
% DPER < TPER	17.09	DPER	37.13	TPER	44.79
Assessor Details	Mrs. Rebecca Lennon			Assessor ID	P627-0001
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	89.0000 (1b)	x 2.4000 (2b)	= 213.6000 (1b) - (3b)
First floor	74.8000 (1c)	x 2.6000 (2c)	= 194.4800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	163.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 408.0800 (5)

2. Ventilation rate

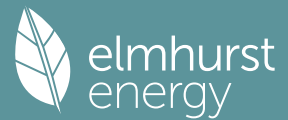
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	1 * 20 = 20.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	5 * 10 = 50.0000 (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) =	70.0000 / (5) = 0.1715 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3715 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3158 (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	0.4027	0.3948	0.3869	0.3474	0.3395	0.3000	0.3000	0.2921	0.3158	0.3395	0.3553	0.3711 (22b)
Effective ac	0.5811	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5427	0.5499	0.5576	0.5631	0.5688 (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							
Ent Door			1.9600	1.2000	2.3520		(26a)
Windows			30.8600	1.1450	35.3359		(27)
Side Door			1.9600	1.2000	2.3520		(26a)
Heatloss Floor 1			89.0000	0.1200	10.6800	75.0000	6675.0000 (28a)
Brick	171.4200	32.3300	139.0900	0.2000	27.8180	60.0000	8345.4000 (29a)
Cladding	22.8000	2.4500	20.3500	0.1900	3.8665	60.0000	1221.0000 (29a)
Planned Roof	89.0000		89.0000	0.0900	8.0100	9.0000	801.0000 (30)
Total net area of external elements Aum(A, m ²)			372.2200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	90.4144		(33)
Main dwelling							
Internal Wall 1			269.7600			9.0000	2427.8400 (32c)
Internal Floor 1			74.8000			18.0000	1346.4000 (32d)
Internal Ceiling 1			74.8000			9.0000	673.2000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	21489.8400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							131.1956 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E16 Corner (normal)				32.0000	0.0570	1.8240	

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E17 Corner (inverted - internal area greater than external area)	12.0000	-0.0510	-0.6120	
E12 Gable (insulation at ceiling level)	14.6000	0.0730	1.0658	
E10 Eaves (insulation at ceiling level)	29.9000	0.0840	2.5116	
E2 Other lintels (including other steel lintels)	22.1000	0.0480	1.0608	
E3 Sill	20.2400	0.0450	0.9108	
E4 Jamb	47.7000	0.0510	2.4327	
E5 Ground floor (normal)	42.9000	0.0640	2.7456	
E6 Intermediate floor within a dwelling	35.1000	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				11.9393 (36)
Point Thermal bridges				0.0000
Total fabric heat loss		(33) + (36) + (36a) =		102.3537 (37)

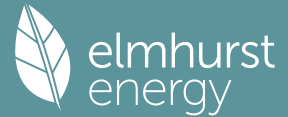
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	78.2498	77.8259	77.4104	75.4587	75.0936	73.3938	73.3938	73.0790	74.0485	75.0936	75.8323	76.6045 (38)
Average = Sum(39)m / 12 =	180.6035	180.1796	179.7641	177.8124	177.4473	175.7475	175.7475	175.4327	176.4022	177.4473	178.1860	178.9582 (39)
												177.8107
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1026	1.1000	1.0975	1.0855	1.0833	1.0729	1.0729	1.0710	1.0769	1.0833	1.0878	1.0925 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.9542 (42)
Hot water usage for mixer showers												
	73.7517	72.6434	71.0283	67.9381	65.6577	63.1145	61.6690	63.2719	65.0289	67.7595	70.9160	73.4691 (42a)
Hot water usage for baths												
	31.8389	31.3660	30.7001	29.4724	28.5531	27.5337	26.9831	27.6443	28.3642	29.4550	30.7080	31.7312 (42b)
Hot water usage for other uses												
	44.8837	43.2516	41.6195	39.9873	38.3552	36.7231	36.7231	38.3552	39.9873	41.6195	43.2516	44.8837 (42c)
Average daily hot water use (litres/day)												138.3197 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	150.4743	147.2610	143.3479	137.3979	132.5659	127.3713	125.3751	129.2713	133.3804	138.8339	144.8756	150.0841 (44)
Energy content (annual)	238.3145	209.6977	220.3204	188.0908	178.4592	156.6178	151.6303	160.0649	164.4714	188.3963	206.4019	234.9955 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 2297.4608
	35.7472	31.4547	33.0481	28.2136	26.7689	23.4927	22.7446	24.0097	24.6707	28.2594	30.9603	35.2493 (46)
Water storage loss:												250.0000 (47)
Store volume												1.1000 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.5940 (55)
Enter (49) or (54) in (55)												
Total storage loss												
	18.4140	16.6320	18.4140	17.8200	18.4140	17.8200	18.4140	18.4140	17.8200	18.4140	17.8200	18.4140 (56)
If cylinder contains dedicated solar storage												
	18.4140	16.6320	18.4140	17.8200	18.4140	17.8200	18.4140	18.4140	17.8200	18.4140	17.8200	18.4140 (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												
	279.9909	247.3409	261.9968	228.4228	220.1356	196.9498	193.3067	201.7413	204.8034	230.0727	246.7339	276.6719 (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	279.9909	247.3409	261.9968	228.4228	220.1356	196.9498	193.3067	201.7413	204.8034	230.0727	246.7339	276.6719 (64)
12Total per year (kWh/year)												2788.1668 (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												
	112.5807	99.8390	106.5976	94.8058	92.6788	84.3410	83.7582	86.5627	86.9523	95.9829	100.8942	111.4771 (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	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	171.4928	189.8670	171.4928	177.2092	171.4928	177.2092	171.4928	171.4928	177.2092	171.4928	177.2092	171.4928 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	335.1714	338.6494	329.8849	311.2262	287.6731	265.5364	250.7478	247.2697	256.0343	274.6929	298.2461	320.3827 (68)
Pumps, fans	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709 (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)
Water heating gains (Table 5)	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671 (71)
Total internal gains	151.3182	148.5700	143.2764	131.6747	124.5683	117.1403	112.5782	116.3477	120.7671	129.0093	140.1309	149.8348 (72)
	725.2950	744.3991	711.9668	687.4229	651.0469	627.1987	602.1315	602.4229	621.3233	642.5077	682.8989	709.0230 (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					1.6200	11.2829		0.5100	0.0000	0.7700		7.1779 (75)
Southeast					17.8700	36.7938		0.5100	0.0000	0.7700		258.2025 (77)
Northwest					11.3700	11.2829		0.5100	0.0000	0.7700		50.3783 (81)
Solar gains	315.7588	556.9718	812.8536	1092.2808	1301.1353	1325.8993	1264.0871	1103.0478	908.7979	629.2642	381.6878	267.9709 (83)
Total gains	1041.0538	1301.3709	1524.8204	1779.7037	1952.1822	1953.0979	1866.2186	1705.4708	1530.1212	1271.7719	1064.5866	976.9939 (84)

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7. Mean internal temperature (heating season)												
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	33.0525	33.1303	33.2069	33.5713	33.6404	33.9658	33.9658	34.0267	33.8397	33.6404	33.5010	33.3564
alpha	3.2035	3.2087	3.2138	3.2381	3.2427	3.2644	3.2644	3.2684	3.2560	3.2427	3.2334	3.2238
util living area	0.9781	0.9564	0.9173	0.8308	0.6966	0.5313	0.4004	0.4507	0.6714	0.8829	0.9617	0.9818 (86)
Living	19.3113	19.5828	19.9399	20.3658	20.6723	20.8358	20.8847	20.8750	20.7530	20.3258	19.7415	19.2677
Non living	18.0125	18.3564	18.8037	19.3273	19.6777	19.8513	19.8915	19.8872	19.7758	19.2944	18.5683	17.9630
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	20.1361	19.5828	19.9399	20.3658	20.6723	20.8358	20.8847	20.8750	20.7530	20.3258	19.7415	19.5100 (87)
Th 2	19.9987	20.0008	20.0029	20.0127	20.0145	20.0230	20.0230	20.0246	20.0197	20.0145	20.0108	20.0069 (88)
util rest of house	0.9741	0.9488	0.9029	0.8023	0.6487	0.4628	0.3169	0.3634	0.6047	0.8562	0.9538	0.9785 (89)
MIT 2	19.2069	18.3564	18.8037	19.3273	19.6777	19.8513	19.8915	19.8872	19.7758	19.2944	18.5683	18.3313 (90)
Living area fraction	19.3022	18.4822	18.9203	19.4338	19.7797	19.9523	19.9934	19.9885	19.8761	19.4001	18.6886	18.4522 (91)
MIT	19.3022	18.4822	18.9203	19.4338	19.7797	19.9523	19.9934	19.9885	19.8761	19.4001	18.6886	18.4522 (92)
Temperature adjustment	19.3022	18.4822	18.9203	19.4338	19.7797	19.9523	19.9934	19.9885	19.8761	19.4001	18.6886	0.0000
adjusted MIT	19.3022	18.4822	18.9203	19.4338	19.7797	19.9523	19.9934	19.9885	19.8761	19.4001	18.6886	18.4522 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9707	0.9336	0.8836	0.7832	0.6362	0.4576	0.3143	0.3600	0.5940	0.8360	0.9395	0.9715 (94)
Useful gains	1010.5753	1215.0017	1347.2829	1393.8411	1242.0355	893.6570	586.5124	614.0319	908.8230	1063.1563	1000.1380	949.1793 (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	2709.4507	2447.2309	2232.7149	1873.0441	1433.7225	940.6461	596.3838	629.5387	1018.9102	1561.5619	2064.9293	2550.5505 (97)
Space heating kWh	1263.9633	828.0580	658.7614	345.0262	142.6151	0.0000	0.0000	0.0000	0.0000	370.8138	766.6498	1191.4202 (98a)
Space heating requirement - total per year (kWh/year)												5567.3077
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	1263.9633	828.0580	658.7614	345.0262	142.6151	0.0000	0.0000	0.0000	0.0000	370.8138	766.6498	1191.4202 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5567.3077
Space heating per m2										(98c) / (4) =		33.9884 (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 %)												282.5014 (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	1263.9633	828.0580	658.7614	345.0262	142.6151	0.0000	0.0000	0.0000	0.0000	370.8138	766.6498	1191.4202 (98)
Space heating efficiency (main heating system 1)	282.5014	282.5014	282.5014	282.5014	282.5014	0.0000	0.0000	0.0000	0.0000	282.5014	282.5014	282.5014 (210)
Space heating fuel (main heating system)	447.4185	293.1165	233.1887	122.1326	50.4830	0.0000	0.0000	0.0000	0.0000	131.2609	271.3791	421.7396 (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	279.9909	247.3409	261.9968	228.4228	220.1356	196.9498	193.3067	201.7413	204.8034	230.0727	246.7339	276.6719 (64)
Efficiency of water heater (217)m	177.3323	177.3323	177.3323	177.3323	177.3323	177.3323	177.3323	177.3323	177.3323	177.3323	177.3323	177.3323 (216)
Fuel for water heating, kWh/month	157.8906	139.4788	147.7434	128.8106	124.1374	111.0626	109.0082	113.7646	115.4913	129.7410	139.1365	156.0189 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	44.9210	36.0373	32.4476	23.7725	18.3626	15.0024	16.7509	21.7735	28.2816	37.1070	41.9123	46.1695 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1970.7189 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												177.3323
Water heating fuel used												1572.2839 (219)
Space cooling fuel												0.0000 (221)

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Electricity for pumps and fans:
Total electricity for the above, kWh/year 0.0000 (231)
Electricity for lighting (calculated in Appendix L) 362.5384 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 3905.5413 (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 (high-rate cost)	1576.5752	0.1636	257.8782 (261)
Space heating - main system 1 (low-rate cost)	394.1438	0.1373	54.1221 (261)
Total CO2 associated with community systems			0.0000 (261)
Water heating - high rate cost	1100.5988	0.1480	162.9114 (264)
Water heating - low rate cost	471.6852	0.1242	58.5977 (264)
Space and water heating			533.5095 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	362.5384	0.1490	54.0254 (268)
Total CO2, kg/year			587.5349 (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 (high-rate cost)	1576.5752	1.2878	2537.8243 (275)
Space heating - main system 1 (low-rate cost)	394.1438	1.4971	590.0720 (275)
Total CO2 associated with community systems			0.0000 (275)
Water heating - high rate cost	1100.5988	1.5533	1709.5514 (278)
Water heating - low rate cost	471.6852	1.4446	681.4026 (278)
Space and water heating			5518.8503 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	362.5384	1.5547	563.6546 (282)
Total Primary energy kWh/year			6082.5049 (286)
Dwelling Primary energy Rate (DPER)			37.1300 (287)

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

1. Overall dwelling characteristics

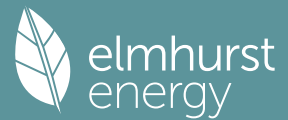
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	89.0000 (1b)	x 2.4000 (2b)	= 213.6000 (1b) - (3b)
First floor	74.8000 (1c)	x 2.6000 (2c)	= 194.4800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	163.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	408.0800 (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) = 0.0980 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3480 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2958 (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	0.3772	0.3698	0.3624	0.3254	0.3180	0.2810	0.2810	0.2736	0.2958	0.3180	0.3328	0.3476 (22b)
Effective ac	0.5711	0.5684	0.5657	0.5529	0.5506	0.5395	0.5395	0.5374	0.5438	0.5506	0.5554	0.5604 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Semi-glazed door			3.9200	1.0000	3.9200			(26a)
TER Opening Type			30.8600	1.1450	35.3359			(27)
Heatloss Floor 1			89.0000	0.1300	11.5700			(28a)
Brick	171.4200	32.3300	139.0900	0.1800	25.0362			(29a)
Cladding	22.8000	2.4500	20.3500	0.1800	3.6630			(29a)
Planned Roof	89.0000		89.0000	0.1100	9.7900			(30)
Total net area of external elements Aum(A, m2)			372.2200					(31)
Fabric heat loss, W/K = Sum (A x U)								(33)
								(26) ... (30) + (32) = 89.3151

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

131.1956 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E16 Corner (normal)	32.0000	0.0900	2.8800	
E17 Corner (inverted - internal area greater than external area)	12.0000	-0.0900	-1.0800	
E12 Gable (insulation at ceiling level)	14.6000	0.0600	0.8760	
E10 Eaves (insulation at ceiling level)	29.9000	0.0600	1.7940	
E2 Other lintels (including other steel lintels)	22.1000	0.0500	1.1050	
E3 Sill	20.2400	0.0500	1.0120	
E4 Jamb	47.7000	0.0500	2.3850	
E5 Ground floor (normal)	42.9000	0.1600	6.8640	
E6 Intermediate floor within a dwelling	35.1000	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				15.8360 (36)
Point Thermal Bridges				0.0000 (36a)
Total fabric heat loss				(33) + (36) + (36a) = 105.1511 (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	76.9117	76.5397	76.1751	74.4627	74.1423	72.6509	72.6509	72.3747	73.2254	74.1423	74.7905	75.4681	(38)
Heat transfer coeff	182.0627	181.6908	181.3262	179.6138	179.2934	177.8020	177.8020	177.5258	178.3765	179.2934	179.9416	180.6192	(39)
Average = Sum(39)m / 12 =													179.6123

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1115	1.1092	1.1070	1.0965	1.0946	1.0855	1.0855	1.0838	1.0890	1.0946	1.0985	1.1027	(40)
HLP (average)												1.0965	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

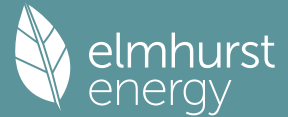
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9542 (42)
Hot water usage for mixer showers													
73.7517	72.6434	71.0283	67.9381	65.6577	63.1145	61.6690	63.2719	65.0289	67.7595	70.9160	73.4691	(42a)	
Hot water usage for baths													
31.8389	31.3660	30.7001	29.4724	28.5531	27.5337	26.9831	27.6443	28.3642	29.4550	30.7080	31.7312	(42b)	
Hot water usage for other uses													
44.8837	43.2516	41.6195	39.9873	38.3552	36.7231	36.7231	38.3552	39.9873	41.6195	43.2516	44.8837	(42c)	
Average daily hot water use (litres/day)													138.3197 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
150.4743	147.2610	143.3479	137.3979	132.5659	127.3713	125.3751	129.2713	133.3804	138.8339	144.8756	150.0841	(44)	
Energy content (annual)	238.3145	209.6977	220.3204	188.0908	178.4592	156.6178	151.6303	160.0649	164.4714	188.3963	206.4019	234.9955	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =			2297.4608
35.7472	31.4547	33.0481	28.2136	26.7689	23.4927	22.7446	24.0097	24.6707	28.2594	30.9603	35.2493	(46)	
Water storage loss:													
Store volume													250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.8903 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.0208 (55)
Total storage loss													
31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(56)	
If cylinder contains dedicated solar storage													
31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(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													
293.2213	259.2909	275.2272	241.2264	233.3660	209.7534	206.5371	214.9717	217.6070	243.3031	259.5375	289.9022	(62)	
WWHRS	-33.7162	-29.8189	-31.2246	-25.8552	-24.0961	-20.6192	-19.3272	-20.5526	-21.3335	-25.1498	-28.4917	-33.0918	(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													
259.5051	229.4720	244.0026	215.3712	209.2699	189.1342	187.2099	194.4191	196.2736	218.1533	231.0458	256.8104	(64)	
12Total per year (kWh/year)													2630.6671 (64)
Electric shower(s)													2631 (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													
123.1650	109.3991	117.1820	105.0487	103.2631	94.5839	94.3425	97.1470	97.1952	106.5672	111.1371	122.0614	(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	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	171.4928	189.8670	171.4928	177.2092	171.4928	177.2092	171.4928	171.4928	177.2092	171.4928	177.2092	171.4928	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	335.1714	338.6494	329.8849	311.2262	287.6731	265.5364	250.7478	247.2697	256.0343	274.6929	298.2461	320.3827	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709	(69)
Pumps, fans	3.0000	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)													
	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	(71)
Water heating gains (Table 5)													
	165.5444	162.7962	157.5026	145.9009	138.7945	131.3665	126.8045	130.5739	134.9934	143.2355	154.3571	164.0610	(72)

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Total internal gains
742.5213 761.6254 729.1930 704.6491 668.2731 641.4249 616.3577 616.6492 635.5496 659.7339 700.1251 726.2493 (73)

6. Solar gains

[Jan]	Area m ²		Solar flux Table 6a W/m ²		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
Northeast	1.6200		11.2829		0.6300		0.7000		0.7700		5.5861 (75)	
Southeast	17.8700		36.7938		0.6300		0.7000		0.7700		200.9423 (77)	
Northwest	11.3700		11.2829		0.6300		0.7000		0.7700		39.2062 (81)	
Solar gains	245.7346	433.4551	632.5914	850.0515	1012.5894	1031.8616	983.7572	858.4308	707.2586	489.7156	297.0429	208.5444 (83)
Total gains	988.2559	1195.0805	1361.7844	1554.7006	1680.8625	1673.2865	1600.1149	1475.0799	1342.8081	1149.4495	997.1680	934.7937 (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	32.7876	32.8547	32.9208	33.2346	33.2940	33.5733	33.5733	33.6255	33.4652	33.2940	33.1741	33.0496
alpha	3.1858	3.1903	3.1947	3.2156	3.2196	3.2382	3.2382	3.2417	3.2310	3.2196	3.2116	3.2033
util living area	0.9810	0.9652	0.9371	0.8718	0.7599	0.6025	0.4630	0.5140	0.7294	0.9072	0.9680	0.9840 (86)
MIT	18.8045	19.1204	19.5636	20.1291	20.5844	20.8614	20.9558	20.9376	20.7317	20.1243	19.3654	18.7524 (87)
Th 2	19.9915	19.9933	19.9951	20.0037	20.0053	20.0127	20.0127	20.0141	20.0098	20.0053	20.0020	19.9986 (88)
util rest of house	0.9775	0.9589	0.9254	0.8477	0.7149	0.5301	0.3689	0.4179	0.6646	0.8844	0.9611	0.9810 (89)
MIT 2	17.4193	17.8202	18.3785	19.0794	19.6123	19.9093	19.9900	19.9796	19.7883	19.0896	18.1404	17.3574 (90)
Living area fraction	17.5613	17.9535	18.5001	19.1871	19.7120	20.0070	20.0890	20.0779	19.8850	19.1957	18.2660	17.5005 (92)
MIT	17.5613	17.9535	18.5001	19.1871	19.7120	20.0070	20.0890	20.0779	19.8850	19.1957	18.2660	17.5005 (93)
Temperature adjustment												0.0000
adjusted MIT	17.5613	17.9535	18.5001	19.1871	19.7120	20.0070	20.0890	20.0779	19.8850	19.1957	18.2660	17.5005 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9649	0.9409	0.9027	0.8240	0.7000	0.5296	0.3765	0.4245	0.6554	0.8607	0.9440	0.9697 (94)
Useful gains	953.5213	1124.5087	1229.2152	1281.0392	1176.6488	886.2128	602.3709	626.1578	880.0530	989.3474	941.3070	906.4874 (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	2414.3967	2371.7056	2175.9248	1847.7043	1436.5024	961.3677	620.3577	652.9179	1031.9160	1541.1482	2009.2350	2402.3201 (97)
Space heating kWh	1086.8913	838.1163	704.3519	407.9989	193.3312	0.0000	0.0000	0.0000	0.0000	410.5398	768.9081	1112.8995 (98a)
Space heating requirement - total per year (kWh/year)												5523.0370
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	1086.8913	838.1163	704.3519	407.9989	193.3312	0.0000	0.0000	0.0000	0.0000	410.5398	768.9081	1112.8995 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5523.0370
Space heating per m ²										(98c) / (4) =		33.7182 (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	1086.8913	838.1163	704.3519	407.9989	193.3312	0.0000	0.0000	0.0000	0.0000	410.5398	768.9081	1112.8995 (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)	1177.5637	908.0350	763.1115	442.0356	209.4595	0.0000	0.0000	0.0000	0.0000	444.7885	833.0532	1205.7416 (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	259.5051	229.4720	244.0026	215.3712	209.2699	189.1342	187.2099	194.4191	196.2736	218.1533	231.0458	256.8104 (64)
Efficiency of water heater	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000 (216)
(217)m	86.9108	86.6983	86.2959	85.4696	83.8825	79.8000	79.8000	79.8000	79.8000	85.4557	86.5447	86.9611 (217)
Fuel for water heating, kWh/month	298.5880	264.6789	282.7511	251.9856	249.4797	237.0103	234.5989	243.6330	245.9568	255.2823	266.9669	295.3163 (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	35.6328	28.5860	25.7385	18.8571	14.5658	11.9004	13.2874	17.2715	22.4339	29.4345	33.2462	36.6232 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-74.7690	-101.3501	-140.0854	-151.1761	-157.7476	-145.2277	-143.2258	-137.6001	-127.1674	-112.6017	-80.6526	-65.1107 (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)												

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(233b)m	-55.5446	-115.0129	-225.3834	-334.0546	-437.6041	-438.3749	-433.3952	-368.9684	-273.0287	-163.1805	-73.7051	-44.0817	(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												5983.7887	(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												3126.2479	(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)												287.5773	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-4399.0480	(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												5084.5659	(238)

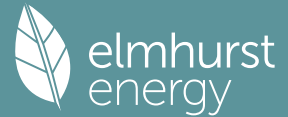
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	5983.7887	0.2100	1256.5956	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3126.2479	0.2100	656.5121	(264)
Space and water heating			1913.1077	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	287.5773	0.1443	41.5063	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1436.7140	0.1355	-194.6337	
PV Unit electricity exported	-2962.3339	0.1263	-374.0890	
Total			-568.7227	(269)
Total CO2, kg/year			1397.8205	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.5300	(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	5983.7887	1.1300	6761.6813	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3126.2479	1.1300	3532.6601	(278)
Space and water heating			10294.3414	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	287.5773	1.5338	441.0956	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1436.7140	1.5007	-2156.1177	
PV Unit electricity exported	-2962.3339	0.4636	-1373.2131	
Total			-3529.3308	(283)
Total Primary energy kWh/year			7336.2070	(286)
Target Primary Energy Rate (TPER)			44.7900	(287)

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Property Reference	P7 Ladds			Issued on Date	21/08/2025
Assessment Reference	Detached	Prop Type Ref	Semi		
Property	1, Bath Road, Hare Hatch, Berkshire, RG10 9SA				
SAP Rating	81 B	DER	3.59	TER	8.53
Environmental	96 A	% DER < TER			57.91
CO ₂ Emissions (t/year)	0.53	DFEE	36.28	TFEE	39.50
Compliance Check	See BREL	% DFEE < TFEE			8.14
% DPER < TPER	17.09	DPER	37.13	TPER	44.79
Assessor Details	Mrs. Rebecca Lennon			Assessor ID	P627-0001
Client					

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	89.0000 (1b)	x 2.4000 (2b)	= 213.6000 (1b) - (3b)
First floor	74.8000 (1c)	x 2.6000 (2c)	= 194.4800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	163.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 408.0800 (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	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) = 0.0980 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.2980 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2533 (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	0.3230	0.3166	0.3103	0.2786	0.2723	0.2407	0.2407	0.2343	0.2533	0.2723	0.2850	0.2976 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5522	0.5501	0.5481	0.5388	0.5371	0.5290	0.5290	0.5275	0.5321	0.5371	0.5406	0.5443 (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							
Ent Door			1.9600	1.2000	2.3520		(26a)
Windows			30.8600	1.1450	35.3359		(27)
Side Door			1.9600	1.2000	2.3520		(26a)
Heatloss Floor 1			89.0000	0.1200	10.6800	75.0000	6675.0000 (28a)
Brick	171.4200	32.3300	139.0900	0.2000	27.8180	60.0000	8345.4000 (29a)
Cladding	22.8000	2.4500	20.3500	0.1900	3.8665	60.0000	1221.0000 (29a)
Planned Roof	89.0000		89.0000	0.0900	8.0100	9.0000	801.0000 (30)
Total net area of external elements Aum(A, m ²)			372.2200				(31)
Fabric heat loss, W/K = Sum (A x k)			(26)...(30) + (32) =		90.4144		(33)
Main dwelling							
Internal Wall 1			269.7600			9.0000	2427.8400 (32c)
Internal Floor 1			74.8000			18.0000	1346.4000 (32d)
Internal Ceiling 1			74.8000			9.0000	673.2000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	21489.8400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							131.1956 (35)
List of Thermal Bridges							

elmhurst
energy

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
	74.3571	74.0844	73.8170	72.5613	72.3264	71.2327	71.2327	71.0301	71.6539	72.3264	72.8016	73.2985 (38)
Heat transfer coeff												
	176.7108	176.4380	176.1707	174.9150	174.6800	173.5863	173.5863	173.3838	174.0076	174.6800	175.1553	175.6522 (39)
Average = Sum(39)m / 12 =												174.9138
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1.0788	1.0772	1.0755	1.0679	1.0664	1.0597	1.0597	1.0585	1.0623	1.0664	1.0693	1.0724 (40)
HLP (average)												1.0679
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

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	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	171.4928	189.8670	171.4928	177.2092	171.4928	177.2092	171.4928	171.4928	177.2092	171.4928	177.2092	171.4928 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	335.1714	338.6494	329.8849	311.2262	287.6731	265.5364	250.7478	247.2697	256.0343	274.6929	298.2461	320.3827 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709 (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)	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671 (71)
Water heating gains (Table 5)	54.5518	53.1778	51.0567	47.1049	44.4986	41.8234	40.5102	42.1136	43.9166	46.8566	50.6764	54.1093 (72)
Total internal gains	628.5287	649.0069	619.7471	602.8530	570.9772	551.8817	530.0634	528.1888	544.4728	560.3550	593.4444	613.2975 (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					1.6200	11.2829	0.5100	0.0000	0.7700	7.1779 (75)		
Southeast					17.8700	36.7938	0.5100	0.0000	0.7700	258.2025 (77)		
Northwest					11.3700	11.2829	0.5100	0.0000	0.7700	50.3783 (81)		
Solar gains	315.7588	556.9718	812.8536	1092.2808	1301.1353	1325.8993	1264.0871	1103.0478	908.7979	629.2642	381.6878	267.9709 (83)
Total gains	944.2874	1205.9787	1432.6007	1695.1338	1872.1125	1877.7810	1794.1505	1631.2367	1453.2707	1189.6192	975.1322	881.2684 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	33.7806	33.8328	33.8842	34.1274	34.1733	34.3886	34.3886	34.4288	34.3054	34.1733	34.0806	33.9842
alpha	3.2520	3.2555	3.2589	3.2752	3.2782	3.2926	3.2926	3.2953	3.2870	3.2782	3.2720	3.2656
util living area	0.9832	0.9637	0.9271	0.8430	0.7093	0.5437	0.4106	0.4641	0.6890	0.8970	0.9694	0.9864 (86)
MIT	18.8348	19.2023	19.6860	20.2617	20.6813	20.9031	20.9709	20.9564	20.7856	20.1946	19.4011	18.7673 (87)
Th 2	20.0182	20.0195	20.0209	20.0272	20.0283	20.0338	20.0338	20.0349	20.0317	20.0283	20.0260	20.0235 (88)
util rest of house	0.9800	0.9572	0.9141	0.8160	0.6623	0.4750	0.3263	0.3758	0.6234	0.8728	0.9628	0.9838 (89)
MIT 2	18.0355	18.3988	18.8718	19.4224	19.7974	19.9786	20.0224	20.0164	19.8959	19.3744	18.6034	17.9724 (90)
Living area fraction									fLA = Living area / (4) =			0.1026 (91)
MIT	18.1175	18.4812	18.9553	19.5085	19.8881	20.0734	20.1196	20.1128	19.9872	19.4585	18.6852	18.0539 (92)
Temperature adjustment												0.0000
adjusted MIT	18.1175	18.4812	18.9553	19.5085	19.8881	20.0734	20.1196	20.1128	19.9872	19.4585	18.6852	18.0539 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9716	0.9438	0.8967	0.7995	0.6549	0.4779	0.3340	0.3833	0.6201	0.8554	0.9506	0.9766 (94)
Useful gains	917.4517	1138.2590	1284.5930	1355.2128	1226.0685	897.4704	599.2378	625.2011	901.1030	1017.6091	926.9774	860.6120 (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	2441.6998	2396.2442	2194.2582	1855.5862	1430.2935	950.1103	610.9618	643.7438	1024.4106	1547.4013	2029.2080	2433.4657 (97)
Space heating kWh	1134.0406	845.3661	676.7909	360.2689	151.9434	0.0000	0.0000	0.0000	0.0000	394.1654	793.6061	1170.2031 (98a)
Space heating requirement - total per year (kWh/year)												5526.3843
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	1134.0406	845.3661	676.7909	360.2689	151.9434	0.0000	0.0000	0.0000	0.0000	394.1654	793.6061	1170.2031 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5526.3843
Space heating per m2										(98c) / (4) =		33.7386 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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												
	0.0000	0.0000	0.0000	0.0000	0.0000	1631.7116	1284.5389	1317.7169	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8556	0.9046	0.8754	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1396.0201	1162.0251	1153.5787	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2117.6666	2023.2412	1836.2872	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	519.5855	640.7447	507.9351	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	129.8964	160.1862	126.9838	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												417.0663 (107)
Energy for space heating												33.7386 (99)
Energy for space cooling												2.5462 (108)
Total												36.2848 (109)
Fabric Energy Efficiency (DFEE)												36.3 (109)

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

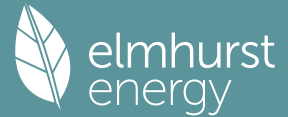
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	89.0000 (1b)	x 2.4000 (2b)	= 213.6000 (1b) - (3b)
First floor	74.8000 (1c)	x 2.6000 (2c)	= 194.4800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	163.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 408.0800 (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)

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Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											Air changes per hour	
Pressure test												40.0000 / (5) =	0.0980 (8)
Pressure Test Method												Yes	
Measured/design AP50												Blower Door	
Infiltration rate												5.0000 (17)	
Number of sides sheltered												0.3480 (18)	
												2 (19)	
Shelter factor												(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) =	0.2958 (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)	
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)	
	0.3772	0.3698	0.3624	0.3254	0.3180	0.2810	0.2810	0.2736	0.2958	0.3180	0.3328	0.3476 (22b)	
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)	
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)	
Effective ac	0.5711	0.5684	0.5657	0.5529	0.5506	0.5395	0.5395	0.5374	0.5438	0.5506	0.5554	0.5604 (25)	

3. Heat losses and heat loss parameter

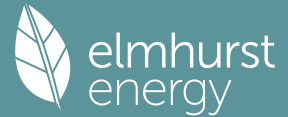
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Semi-glazed door			3.9200	1.0000	3.9200		(26a)
TER Opening Type			30.8600	1.1450	35.3359		(27)
Heatloss Floor 1			89.0000	0.1300	11.5700		(28a)
Brick	171.4200	32.3300	139.0900	0.1800	25.0362		(29a)
Cladding	22.8000	2.4500	20.3500	0.1800	3.6630		(29a)
Planned Roof	89.0000		89.0000	0.1100	9.7900		(30)
Total net area of external elements Aum(A, m2)			372.2200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	89.3151	(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							131.1956 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E16 Corner (normal)				32.0000	0.0900	2.8800	
E17 Corner (inverted - internal area greater than external area)				12.0000	-0.0900	-1.0800	
E12 Gable (insulation at ceiling level)				14.6000	0.0600	0.8760	
E10 Eaves (insulation at ceiling level)				29.9000	0.0600	1.7940	
E2 Other lintels (including other steel lintels)				22.1000	0.0500	1.1050	
E3 Sill				20.2400	0.0500	1.0120	
E4 Jamb				47.7000	0.0500	2.3850	
E5 Ground floor (normal)				42.9000	0.1600	6.8640	
E6 Intermediate floor within a dwelling				35.1000	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.8360 (36)
Point Thermal bridges							(36a) = 0.0000
Total fabric heat loss							(33) + (36) + (36a) = 105.1511 (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
	76.9117	76.5397	76.1751	74.4627	74.1423	72.6509	72.6509	72.3747	73.2254	74.1423	74.7905	75.4681 (38)
Heat transfer coeff	182.0627	181.6908	181.3262	179.6138	179.2934	177.8020	177.8020	177.5258	178.3765	179.2934	179.9416	180.6192 (39)
Average = Sum(39)m / 12 =												179.6123
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1115	1.1092	1.1070	1.0965	1.0946	1.0855	1.0855	1.0838	1.0890	1.0946	1.0985	1.1027 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31
												1.0965
												31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9542 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	31.8389	31.3660	30.7001	29.4724	28.5531	27.5337	26.9831	27.6443	28.3642	29.4550	30.7080	31.7312 (42b)
Hot water usage for other uses	44.8837	43.2516	41.6195	39.9873	38.3552	36.7231	36.7231	38.3552	39.9873	41.6195	43.2516	44.8837 (42c)
Average daily hot water use (litres/day)												70.3231 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	76.7226	74.6176	72.3196	69.4597	66.9083	64.2567	63.7061	65.9995	68.3515	71.0745	73.9596	76.6150 (44)
Distribution loss (46)m = 0.15 x (45)m	121.5099	106.2545	111.1526	95.0869	90.0714	79.0112	77.0470	81.7211	84.2843	96.4474	105.3691	119.9605 (45)
Water storage loss:	Total = Sum(45)m =											1167.9158
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (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 (59)
Total heat required for water heating calculated for each month	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)
WWHRS	103.2834	90.3163	94.4797	80.8239	76.5607	67.1595	65.4900	69.4630	71.6417	81.9803	89.5637	101.9665 (62)
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 (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)
12Total per year (kWh/year)	103.2834	90.3163	94.4797	80.8239	76.5607	67.1595	65.4900	69.4630	71.6417	81.9803	89.5637	101.9665 (64)
Electric shower(s)	Total per year (kWh/year) = Sum(64)m =											992.7284 (64)
Heat gains from water heating, kWh/month	59.0628	52.6255	57.4650	54.8381	55.8672	53.2918	55.0682	55.8672	54.8381	57.4650	56.3844	59.0628 (64a)
	Total Energy used by instantaneous electric shower(s) = Sum(64a)m =											671.8362 (64a)
	40.5866	35.7354	37.9862	33.9155	33.1070	30.1128	30.1396	31.3325	31.6199	34.8613	36.4870	40.2573 (65)

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	171.4928	189.8670	171.4928	177.2092	171.4928	177.2092	171.4928	171.4928	177.2092	171.4928	177.2092	171.4928 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	335.1714	338.6494	329.8849	311.2262	287.6731	265.5364	250.7478	247.2697	256.0343	274.6929	298.2461	320.3827 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709 (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)	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671 (71)
Water heating gains (Table 5)	54.5518	53.1778	51.0567	47.1049	44.4986	41.8234	40.5102	42.1136	43.9166	46.8566	50.6764	54.1093 (72)
Total internal gains	628.5287	649.0069	619.7471	602.8530	570.9772	551.8817	530.0634	528.1888	544.4728	560.3550	593.4444	613.2975 (73)

6. Solar gains

[Jan]	Area m ²		Solar flux Table 6a W/m ²		Specific data or Table 6b g		Specific data or Table 6c FF		Access factor Table 6d		Gains W	
Northeast	1.6200		11.2829		0.6300		0.7000		0.7700		5.5861 (75)	
Southeast	17.8700		36.7938		0.6300		0.7000		0.7700		200.9423 (77)	
Northwest	11.3700		11.2829		0.6300		0.7000		0.7700		39.2062 (81)	
Solar gains	245.7346	433.4551	632.5914	850.0515	1012.5894	1031.8616	983.7572	858.4308	707.2586	489.7156	297.0429	208.5444 (83)
Total gains	874.2633	1082.4620	1252.3384	1452.9045	1583.5666	1583.7433	1513.8206	1386.6196	1251.7314	1050.0706	890.4873	821.8419 (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	32.7876	32.8547	32.9208	33.2346	33.2940	33.5733	33.5733	33.6255	33.4652	33.2940	33.1741	33.0496
alpha	3.1858	3.1903	3.1947	3.2156	3.2196	3.2382	3.2382	3.2417	3.2310	3.2196	3.2116	3.2033
util living area	0.9865	0.9732	0.9487	0.8888	0.7823	0.6265	0.4854	0.5403	0.7572	0.9245	0.9763	0.9888 (86)
MIT	18.6910	19.0143	19.4702	20.0609	20.5434	20.8443	20.9493	20.9279	20.6979	20.0477	19.2634	18.6385 (87)
Th 2	19.9915	19.9933	19.9951	20.0037	20.0053	20.0127	20.0127	20.0141	20.0098	20.0053	20.0020	19.9986 (88)
util rest of house	0.9839	0.9682	0.9389	0.8670	0.7390	0.5536	0.3881	0.4415	0.6944	0.9050	0.9711	0.9867 (89)
MIT 2	17.8747	18.1959	18.6456	19.2213	19.6656	19.9212	19.9922	19.9826	19.8125	19.2211	18.4516	17.8275 (90)
Living area fraction	17.9585	18.2798	18.7302	19.3074	19.7556	20.0159	20.0903	20.0795	19.9033	19.3059	18.5349	17.9107 (92)
MIT	17.9585	18.2798	18.7302	19.3074	19.7556	20.0159	20.0903	20.0795	19.9033	19.3059	18.5349	17.9107 (92)
Temperature adjustment												0.0000
adjusted MIT	17.9585	18.2798	18.7302	19.3074	19.7556	20.0159	20.0903	20.0795	19.9033	19.3059	18.5349	17.9107 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9765	0.9566	0.9228	0.8486	0.7268	0.5539	0.3962	0.4484	0.6868	0.8876	0.9603	0.9803 (94)
Useful gains	853.7191	1035.4297	1155.7142	1232.9557	1150.9141	877.1843	599.7107	621.8139	859.6562	931.9990	855.1560	805.6469 (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	2486.6973	2430.9895	2217.6585	1869.3085	1444.3229	962.9613	620.5871	653.2140	1035.1728	1560.9096	2057.6078	2476.4165 (97)
Space heating kWh	1214.9358	937.8161	790.0866	458.1740	218.2962	0.0000	0.0000	0.0000	0.0000	467.9095	865.7653	1243.0526 (98a)
Space heating requirement - total per year (kWh/year)												6196.0360
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	1214.9358	937.8161	790.0866	458.1740	218.2962	0.0000	0.0000	0.0000	0.0000	467.9095	865.7653	1243.0526 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6196.0360
Space heating per m ²												37.8268 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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	0.0000	0.0000	0.0000	0.0000	0.0000	1671.3385	1315.7345	1349.1958	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7863	0.8504	0.8143	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1314.1652	1118.9051	1098.7133	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1773.9862	1695.5828	1550.3711	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	331.0711	429.0482	336.0335	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	82.7678	107.2621	84.0084	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												274.0382 (107)
Energy for space heating												37.8268 (99)
Energy for space cooling												1.6730 (108)
Total												39.4998 (109)
Fabric Energy Efficiency (TFEE)												39.5 (109)

Full SAP Calculation Printout



Property Reference	P7 Ladds			Issued on Date	21/08/2025
Assessment Reference	Detached	Prop Type Ref	Semi		
Property	1, Bath Road, Hare Hatch, Berkshire, RG10 9SA				
SAP Rating	81 B	DER	3.59	TER	8.53
Environmental	96 A	% DER < TER			57.91
CO ₂ Emissions (t/year)	0.53	DFEE	36.28	TFEE	39.50
Compliance Check	See BREL	% DFEE < TFEE			8.14
% DPER < TPER	17.09	DPER	37.13	TPER	44.79
Assessor Details	Mrs. Rebecca Lennon			Assessor ID	P627-0001
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	89.0000 (1b)	x 2.4000 (2b)	= 213.6000 (1b) - (3b)
First floor	74.8000 (1c)	x 2.6000 (2c)	= 194.4800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	163.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 408.0800 (5)

2. Ventilation rate

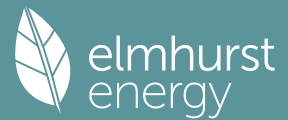
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	1 * 20 = 20.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	5 * 10 = 50.0000 (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) =	70.0000 / (5) = 0.1715 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3715 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3158 (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	0.4027	0.3948	0.3869	0.3474	0.3395	0.3000	0.3000	0.2921	0.3158	0.3395	0.3553	0.3711 (22b)
Effective ac	0.5811	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5427	0.5499	0.5576	0.5631	0.5688 (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							
Ent Door			1.9600	1.2000	2.3520		(26a)
Windows			30.8600	1.1450	35.3359		(27)
Side Door			1.9600	1.2000	2.3520		(26a)
Heatloss Floor 1			89.0000	0.1200	10.6800	75.0000	6675.0000 (28a)
Brick	171.4200	32.3300	139.0900	0.2000	27.8180	60.0000	8345.4000 (29a)
Cladding	22.8000	2.4500	20.3500	0.1900	3.8665	60.0000	1221.0000 (29a)
Planned Roof	89.0000		89.0000	0.0900	8.0100	9.0000	801.0000 (30)
Total net area of external elements Aum(A, m ²)			372.2200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	90.4144		(33)
Main dwelling							
Internal Wall 1			269.7600			9.0000	2427.8400 (32c)
Internal Floor 1			74.8000			18.0000	1346.4000 (32d)
Internal Ceiling 1			74.8000			9.0000	673.2000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	21489.8400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							131.1956 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E16 Corner (normal)				32.0000	0.0570	1.8240	

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E17 Corner (inverted - internal area greater than external area)	12.0000	-0.0510	-0.6120	
E12 Gable (insulation at ceiling level)	14.6000	0.0730	1.0658	
E10 Eaves (insulation at ceiling level)	29.9000	0.0840	2.5116	
E2 Other lintels (including other steel lintels)	22.1000	0.0480	1.0608	
E3 Sill	20.2400	0.0450	0.9108	
E4 Jamb	47.7000	0.0510	2.4327	
E5 Ground floor (normal)	42.9000	0.0640	2.7456	
E6 Intermediate floor within a dwelling	35.1000	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				11.9393 (36)
Point Thermal bridges				0.0000
Total fabric heat loss		(33) + (36) + (36a) =		102.3537 (37)

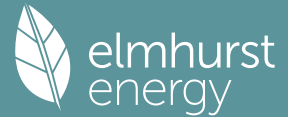
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	78.2498	77.8259	77.4104	75.4587	75.0936	73.3938	73.3938	73.0790	74.0485	75.0936	75.8323	76.6045 (38)
Average = Sum(39)m / 12 =	180.6035	180.1796	179.7641	177.8124	177.4473	175.7475	175.7475	175.4327	176.4022	177.4473	178.1860	178.9582 (39)
												177.8107
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1026	1.1000	1.0975	1.0855	1.0833	1.0729	1.0729	1.0710	1.0769	1.0833	1.0878	1.0925 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.9542 (42)
Hot water usage for mixer showers	73.7517	72.6434	71.0283	67.9381	65.6577	63.1145	61.6690	63.2719	65.0289	67.7595	70.9160	73.4691 (42a)
Hot water usage for baths	31.8389	31.3660	30.7001	29.4724	28.5531	27.5337	26.9831	27.6443	28.3642	29.4550	30.7080	31.7312 (42b)
Hot water usage for other uses	44.8837	43.2516	41.6195	39.9873	38.3552	36.7231	36.7231	38.3552	39.9873	41.6195	43.2516	44.8837 (42c)
Average daily hot water use (litres/day)												138.3197 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	150.4743	147.2610	143.3479	137.3979	132.5659	127.3713	125.3751	129.2713	133.3804	138.8339	144.8756	150.0841 (44)
Energy content (annual)	238.3145	209.6977	220.3204	188.0908	178.4592	156.6178	151.6303	160.0649	164.4714	188.3963	206.4019	234.9955 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 2297.4608
Water storage loss:	35.7472	31.4547	33.0481	28.2136	26.7689	23.4927	22.7446	24.0097	24.6707	28.2594	30.9603	35.2493 (46)
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.1000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.5940 (55)
Total storage loss	18.4140	16.6320	18.4140	17.8200	18.4140	17.8200	18.4140	18.4140	17.8200	18.4140	17.8200	18.4140 (56)
If cylinder contains dedicated solar storage	18.4140	16.6320	18.4140	17.8200	18.4140	17.8200	18.4140	18.4140	17.8200	18.4140	17.8200	18.4140 (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	279.9909	247.3409	261.9968	228.4228	220.1356	196.9498	193.3067	201.7413	204.8034	230.0727	246.7339	276.6719 (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	279.9909	247.3409	261.9968	228.4228	220.1356	196.9498	193.3067	201.7413	204.8034	230.0727	246.7339	276.6719 (64)
12Total per year (kWh/year)												2788.1668 (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	112.5807	99.8390	106.5976	94.8058	92.6788	84.3410	83.7582	86.5627	86.9523	95.9829	100.8942	111.4771 (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	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	171.4928	189.8670	171.4928	177.2092	171.4928	177.2092	171.4928	171.4928	177.2092	171.4928	177.2092	171.4928 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	335.1714	338.6494	329.8849	311.2262	287.6731	265.5364	250.7478	247.2697	256.0343	274.6929	298.2461	320.3827 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709 (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)	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671 (71)
Water heating gains (Table 5)	151.3182	148.5700	143.2764	131.6747	124.5683	117.1403	112.5782	116.3477	120.7671	129.0093	140.1309	149.8348 (72)
Total internal gains	725.2950	744.3991	711.9668	687.4229	651.0469	627.1987	602.1315	602.4229	621.3233	642.5077	682.8989	709.0230 (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					1.6200	11.2829		0.5100	0.0000	0.7700		7.1779 (75)
Southeast					17.8700	36.7938		0.5100	0.0000	0.7700		258.2025 (77)
Northwest					11.3700	11.2829		0.5100	0.0000	0.7700		50.3783 (81)
Solar gains	315.7588	556.9718	812.8536	1092.2808	1301.1353	1325.8993	1264.0871	1103.0478	908.7979	629.2642	381.6878	267.9709 (83)
Total gains	1041.0538	1301.3709	1524.8204	1779.7037	1952.1822	1953.0979	1866.2186	1705.4708	1530.1212	1271.7719	1064.5866	976.9939 (84)

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7. Mean internal temperature (heating season)												
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	33.0525	33.1303	33.2069	33.5713	33.6404	33.9658	33.9658	34.0267	33.8397	33.6404	33.5010	33.3564
alpha	3.2035	3.2087	3.2138	3.2381	3.2427	3.2644	3.2644	3.2684	3.2560	3.2427	3.2334	3.2238
util living area	0.9781	0.9564	0.9173	0.8308	0.6966	0.5313	0.4004	0.4507	0.6714	0.8829	0.9617	0.9818 (86)
Living	19.3113	19.5828	19.9399	20.3658	20.6723	20.8358	20.8847	20.8750	20.7530	20.3258	19.7415	19.2677
Non living	18.0125	18.3564	18.8037	19.3273	19.6777	19.8513	19.8915	19.8872	19.7758	19.2944	18.5683	17.9630
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	20.1361	19.5828	19.9399	20.3658	20.6723	20.8358	20.8847	20.8750	20.7530	20.3258	19.7415	19.5100 (87)
Th 2	19.9987	20.0008	20.0029	20.0127	20.0145	20.0230	20.0230	20.0246	20.0197	20.0145	20.0108	20.0069 (88)
util rest of house	0.9741	0.9488	0.9029	0.8023	0.6487	0.4628	0.3169	0.3634	0.6047	0.8562	0.9538	0.9785 (89)
MIT 2	19.2069	18.3564	18.8037	19.3273	19.6777	19.8513	19.8915	19.8872	19.7758	19.2944	18.5683	18.3313 (90)
Living area fraction	19.3022	18.4822	18.9203	19.4338	19.7797	19.9523	19.9934	19.9885	19.8761	19.4001	18.6886	18.4522 (91)
MIT	19.3022	18.4822	18.9203	19.4338	19.7797	19.9523	19.9934	19.9885	19.8761	19.4001	18.6886	18.4522 (92)
Temperature adjustment	19.3022	18.4822	18.9203	19.4338	19.7797	19.9523	19.9934	19.9885	19.8761	19.4001	18.6886	0.0000
adjusted MIT	19.3022	18.4822	18.9203	19.4338	19.7797	19.9523	19.9934	19.9885	19.8761	19.4001	18.6886	18.4522 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9707	0.9336	0.8836	0.7832	0.6362	0.4576	0.3143	0.3600	0.5940	0.8360	0.9395	0.9715 (94)
Useful gains	1010.5753	1215.0017	1347.2829	1393.8411	1242.0355	893.6570	586.5124	614.0319	908.8230	1063.1563	1000.1380	949.1793 (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	2709.4507	2447.2309	2232.7149	1873.0441	1433.7225	940.6461	596.3838	629.5387	1018.9102	1561.5619	2064.9293	2550.5505 (97)
Space heating kWh	1263.9633	828.0580	658.7614	345.0262	142.6151	0.0000	0.0000	0.0000	0.0000	370.8138	766.6498	1191.4202 (98a)
Space heating requirement - total per year (kWh/year)												5567.3077
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	1263.9633	828.0580	658.7614	345.0262	142.6151	0.0000	0.0000	0.0000	0.0000	370.8138	766.6498	1191.4202 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5567.3077
Space heating per m2										(98c) / (4) =		33.9884 (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 %)												282.5014 (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	1263.9633	828.0580	658.7614	345.0262	142.6151	0.0000	0.0000	0.0000	0.0000	370.8138	766.6498	1191.4202 (98)
Space heating efficiency (main heating system 1)	282.5014	282.5014	282.5014	282.5014	282.5014	0.0000	0.0000	0.0000	0.0000	282.5014	282.5014	282.5014 (210)
Space heating fuel (main heating system)	447.4185	293.1165	233.1887	122.1326	50.4830	0.0000	0.0000	0.0000	0.0000	131.2609	271.3791	421.7396 (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	279.9909	247.3409	261.9968	228.4228	220.1356	196.9498	193.3067	201.7413	204.8034	230.0727	246.7339	276.6719 (64)
Efficiency of water heater (217)m	177.3323	177.3323	177.3323	177.3323	177.3323	177.3323	177.3323	177.3323	177.3323	177.3323	177.3323	177.3323 (216)
Fuel for water heating, kWh/month	157.8906	139.4788	147.7434	128.8106	124.1374	111.0626	109.0082	113.7646	115.4913	129.7410	139.1365	156.0189 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	44.9210	36.0373	32.4476	23.7725	18.3626	15.0024	16.7509	21.7735	28.2816	37.1070	41.9123	46.1695 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1970.7189 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												177.3323
Water heating fuel used												1572.2839 (219)
Space cooling fuel												0.0000 (221)

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Electricity for pumps and fans:
 Total electricity for the above, kWh/year 0.0000 (231)
 Electricity for lighting (calculated in Appendix L) 362.5384 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
 PV generation 0.0000 (233)
 Wind generation 0.0000 (234)
 Hydro-electric generation (Appendix N) 0.0000 (235a)
 Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
 Appendix Q - special features
 Energy saved or generated -0.0000 (236)
 Energy used 0.0000 (237)
 Total delivered energy for all uses 3905.5413 (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 (high-rate cost)	1576.5752	0.1636	257.8782 (261)
Space heating - main system 1 (low-rate cost)	394.1438	0.1373	54.1221 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating - high rate cost	1100.5988	0.1480	162.9114 (264)
Water heating - low rate cost	471.6852	0.1242	58.5977 (264)
Space and water heating			533.5095 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	362.5384	0.1490	54.0254 (268)
Total CO2, kg/year			587.5349 (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 (high-rate cost)	1576.5752	1.2878	2537.8243 (275)
Space heating - main system 1 (low-rate cost)	394.1438	1.4971	590.0720 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating - high rate cost	1100.5988	1.5533	1709.5514 (278)
Water heating - low rate cost	471.6852	1.4446	681.4026 (278)
Space and water heating			5518.8503 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	362.5384	1.5547	563.6546 (282)
Total Primary energy kWh/year			6082.5049 (286)
Dwelling Primary energy Rate (DPER)			37.1300 (287)

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

1. Overall dwelling characteristics

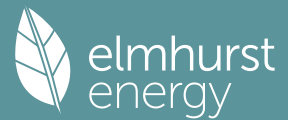
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	89.0000 (1b)	x 2.4000 (2b)	= 213.6000 (1b) - (3b)
First floor	74.8000 (1c)	x 2.6000 (2c)	= 194.4800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	163.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 408.0800 (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) = 0.0980 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3480 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2958 (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	0.3772	0.3698	0.3624	0.3254	0.3180	0.2810	0.2810	0.2736	0.2958	0.3180	0.3328	0.3476 (22b)
Effective ac	0.5711	0.5684	0.5657	0.5529	0.5506	0.5395	0.5395	0.5374	0.5438	0.5506	0.5554	0.5604 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Semi-glazed door			3.9200	1.0000	3.9200			(26a)
TER Opening Type			30.8600	1.1450	35.3359			(27)
Heatloss Floor 1			89.0000	0.1300	11.5700			(28a)
Brick	171.4200	32.3300	139.0900	0.1800	25.0362			(29a)
Cladding	22.8000	2.4500	20.3500	0.1800	3.6630			(29a)
Planned Roof	89.0000		89.0000	0.1100	9.7900			(30)
Total net area of external elements Aum(A, m2)			372.2200					(31)
Fabric heat loss, W/K = Sum (A x U)								(33)
								(26) ... (30) + (32) = 89.3151

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

131.1956 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E16 Corner (normal)	32.0000	0.0900	2.8800	
E17 Corner (inverted - internal area greater than external area)	12.0000	-0.0900	-1.0800	
E12 Gable (insulation at ceiling level)	14.6000	0.0600	0.8760	
E10 Eaves (insulation at ceiling level)	29.9000	0.0600	1.7940	
E2 Other lintels (including other steel lintels)	22.1000	0.0500	1.1050	
E3 Sill	20.2400	0.0500	1.0120	
E4 Jamb	47.7000	0.0500	2.3850	
E5 Ground floor (normal)	42.9000	0.1600	6.8640	
E6 Intermediate floor within a dwelling	35.1000	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				15.8360 (36)
Point Thermal Bridges				0.0000
Total fabric heat loss				(33) + (36) + (36a) = 105.1511 (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	76.9117	76.5397	76.1751	74.4627	74.1423	72.6509	72.6509	72.3747	73.2254	74.1423	74.7905	75.4681	(38)
Heat transfer coeff	182.0627	181.6908	181.3262	179.6138	179.2934	177.8020	177.8020	177.5258	178.3765	179.2934	179.9416	180.6192	(39)
Average = Sum(39)m / 12 =													179.6123

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1115	1.1092	1.1070	1.0965	1.0946	1.0855	1.0855	1.0838	1.0890	1.0946	1.0985	1.1027	(40)
HLP (average)												1.0965	
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	

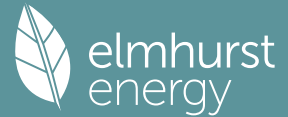
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9542 (42)
Hot water usage for mixer showers													
73.7517	72.6434	71.0283	67.9381	65.6577	63.1145	61.6690	63.2719	65.0289	67.7595	70.9160	73.4691	(42a)	
Hot water usage for baths													
31.8389	31.3660	30.7001	29.4724	28.5531	27.5337	26.9831	27.6443	28.3642	29.4550	30.7080	31.7312	(42b)	
Hot water usage for other uses													
44.8837	43.2516	41.6195	39.9873	38.3552	36.7231	36.7231	38.3552	39.9873	41.6195	43.2516	44.8837	(42c)	
Average daily hot water use (litres/day)													138.3197 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
150.4743	147.2610	143.3479	137.3979	132.5659	127.3713	125.3751	129.2713	133.3804	138.8339	144.8756	150.0841	(44)	
Energy content (annual)	238.3145	209.6977	220.3204	188.0908	178.4592	156.6178	151.6303	160.0649	164.4714	188.3963	206.4019	234.9955	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =			2297.4608
35.7472	31.4547	33.0481	28.2136	26.7689	23.4927	22.7446	24.0097	24.6707	28.2594	30.9603	35.2493	(46)	
Water storage loss:													
Store volume													250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.8903 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.0208 (55)
Total storage loss													
31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(56)	
If cylinder contains dedicated solar storage													
31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(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													
293.2213	259.2909	275.2272	241.2264	233.3660	209.7534	206.5371	214.9717	217.6070	243.3031	259.5375	289.9022	(62)	
WWHRS	-33.7162	-29.8189	-31.2246	-25.8552	-24.0961	-20.6192	-19.3272	-20.5526	-21.3335	-25.1498	-28.4917	-33.0918	(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													
259.5051	229.4720	244.0026	215.3712	209.2699	189.1342	187.2099	194.4191	196.2736	218.1533	231.0458	256.8104	(64)	
12Total per year (kWh/year)													2630.6671 (64)
Electric shower(s)													2631 (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													
123.1650	109.3991	117.1820	105.0487	103.2631	94.5839	94.3425	97.1470	97.1952	106.5672	111.1371	122.0614	(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	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089	147.7089	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	171.4928	189.8670	171.4928	177.2092	171.4928	177.2092	171.4928	171.4928	177.2092	171.4928	177.2092	171.4928	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	335.1714	338.6494	329.8849	311.2262	287.6731	265.5364	250.7478	247.2697	256.0343	274.6929	298.2461	320.3827	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709	37.7709	(69)
Pumps, fans	3.0000	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)													
	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	-118.1671	(71)
Water heating gains (Table 5)													
	165.5444	162.7962	157.5026	145.9009	138.7945	131.3665	126.8045	130.5739	134.9934	143.2355	154.3571	164.0610	(72)

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Total internal gains
742.5213 761.6254 729.1930 704.6491 668.2731 641.4249 616.3577 616.6492 635.5496 659.7339 700.1251 726.2493 (73)

6. Solar gains

[Jan]	Area m ²		Solar flux Table 6a W/m ²		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
Northeast	1.6200		11.2829		0.6300		0.7000		0.7700		5.5861 (75)	
Southeast	17.8700		36.7938		0.6300		0.7000		0.7700		200.9423 (77)	
Northwest	11.3700		11.2829		0.6300		0.7000		0.7700		39.2062 (81)	
Solar gains	245.7346	433.4551	632.5914	850.0515	1012.5894	1031.8616	983.7572	858.4308	707.2586	489.7156	297.0429	208.5444 (83)
Total gains	988.2559	1195.0805	1361.7844	1554.7006	1680.8625	1673.2865	1600.1149	1475.0799	1342.8081	1149.4495	997.1680	934.7937 (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	32.7876	32.8547	32.9208	33.2346	33.2940	33.5733	33.5733	33.6255	33.4652	33.2940	33.1741	33.0496
alpha	3.1858	3.1903	3.1947	3.2156	3.2196	3.2382	3.2382	3.2417	3.2310	3.2196	3.2116	3.2033
util living area	0.9810	0.9652	0.9371	0.8718	0.7599	0.6025	0.4630	0.5140	0.7294	0.9072	0.9680	0.9840 (86)
MIT	18.8045	19.1204	19.5636	20.1291	20.5844	20.8614	20.9558	20.9376	20.7317	20.1243	19.3654	18.7524 (87)
Th 2	19.9915	19.9933	19.9951	20.0037	20.0053	20.0127	20.0127	20.0141	20.0098	20.0053	20.0020	19.9986 (88)
util rest of house	0.9775	0.9589	0.9254	0.8477	0.7149	0.5301	0.3689	0.4179	0.6646	0.8844	0.9611	0.9810 (89)
MIT 2	17.4193	17.8202	18.3785	19.0794	19.6123	19.9093	19.9900	19.9796	19.7883	19.0896	18.1404	17.3574 (90)
Living area fraction	17.5613	17.9535	18.5001	19.1871	19.7120	20.0070	20.0890	20.0779	19.8850	19.1957	18.2660	17.5005 (92)
MIT	17.5613	17.9535	18.5001	19.1871	19.7120	20.0070	20.0890	20.0779	19.8850	19.1957	18.2660	17.5005 (93)
Temperature adjustment												0.0000
adjusted MIT	17.5613	17.9535	18.5001	19.1871	19.7120	20.0070	20.0890	20.0779	19.8850	19.1957	18.2660	17.5005 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9649	0.9409	0.9027	0.8240	0.7000	0.5296	0.3765	0.4245	0.6554	0.8607	0.9440	0.9697 (94)
Useful gains	953.5213	1124.5087	1229.2152	1281.0392	1176.6488	886.2128	602.3709	626.1578	880.0530	989.3474	941.3070	906.4874 (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	2414.3967	2371.7056	2175.9248	1847.7043	1436.5024	961.3677	620.3577	652.9179	1031.9160	1541.1482	2009.2350	2402.3201 (97)
Space heating kWh	1086.8913	838.1163	704.3519	407.9989	193.3312	0.0000	0.0000	0.0000	0.0000	410.5398	768.9081	1112.8995 (98a)
Space heating requirement - total per year (kWh/year)												5523.0370
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	1086.8913	838.1163	704.3519	407.9989	193.3312	0.0000	0.0000	0.0000	0.0000	410.5398	768.9081	1112.8995 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5523.0370
Space heating per m ²										(98c) / (4) =		33.7182 (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	1086.8913	838.1163	704.3519	407.9989	193.3312	0.0000	0.0000	0.0000	0.0000	410.5398	768.9081	1112.8995 (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)	1177.5637	908.0350	763.1115	442.0356	209.4595	0.0000	0.0000	0.0000	0.0000	444.7885	833.0532	1205.7416 (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	259.5051	229.4720	244.0026	215.3712	209.2699	189.1342	187.2099	194.4191	196.2736	218.1533	231.0458	256.8104 (64)
Efficiency of water heater	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000 (216)
(217)m	86.9108	86.6983	86.2959	85.4696	83.8825	79.8000	79.8000	79.8000	79.8000	85.4557	86.5447	86.9611 (217)
Fuel for water heating, kWh/month	298.5880	264.6789	282.7511	251.9856	249.4797	237.0103	234.5989	243.6330	245.9568	255.2823	266.9669	295.3163 (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	35.6328	28.5860	25.7385	18.8571	14.5658	11.9004	13.2874	17.2715	22.4339	29.4345	33.2462	36.6232 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-74.7690	-101.3501	-140.0854	-151.1761	-157.7476	-145.2277	-143.2258	-137.6001	-127.1674	-112.6017	-80.6526	-65.1107 (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)												

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(233b)m	-55.5446	-115.0129	-225.3834	-334.0546	-437.6041	-438.3749	-433.3952	-368.9684	-273.0287	-163.1805	-73.7051	-44.0817	(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												5983.7887	(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												3126.2479	(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)												287.5773	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-4399.0480	(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												5084.5659	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	5983.7887	0.2100	1256.5956	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3126.2479	0.2100	656.5121	(264)
Space and water heating			1913.1077	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	287.5773	0.1443	41.5063	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1436.7140	0.1355	-194.6337	
PV Unit electricity exported	-2962.3339	0.1263	-374.0890	
Total			-568.7227	(269)
Total CO2, kg/year			1397.8205	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.5300	(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	5983.7887	1.1300	6761.6813	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3126.2479	1.1300	3532.6601	(278)
Space and water heating			10294.3414	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	287.5773	1.5338	441.0956	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1436.7140	1.5007	-2156.1177	
PV Unit electricity exported	-2962.3339	0.4636	-1373.2131	
Total			-3529.3308	(283)
Total Primary energy kWh/year			7336.2070	(286)
Target Primary Energy Rate (TPER)			44.7900	(287)

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Property Reference	P14 Ladds			Issued on Date	21/08/2025
Assessment Reference	Detached	Prop Type Ref	Semi		
Property	1, Bath Road, Hare Hatch, Berkshire, RG10 9SA				
SAP Rating	81 B	DER	3.63	TER	9.05
Environmental	96 A	% DER < TER			59.89
CO ₂ Emissions (t/year)	0.56	DFEE	38.16	TFEE	40.01
Compliance Check	See BREL	% DFEE < TFEE			4.61
% DPER < TPER	20.88	DPER	37.51	TPER	47.41
Assessor Details	Mrs. Rebecca Lennon			Assessor ID	P627-0001
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	77.7000 (1b)	x 2.4000 (2b)	= 186.4800 (1b) - (3b)
First floor	57.9000 (1c)	x 2.6000 (2c)	= 150.5400 (1c) - (3c)
Second floor	35.7000 (1d)	x 2.4000 (2d)	= 85.6800 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	171.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 422.7000 (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	5 * 10 = 50.0000 (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)	50.0000 / (5) = 0.1183 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3183 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2705 (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	0.3449	0.3382	0.3314	0.2976	0.2908	0.2570	0.2570	0.2503	0.2705	0.2908	0.3044	0.3179 (22b)
Effective ac	0.5595	0.5572	0.5549	0.5443	0.5423	0.5330	0.5330	0.5313	0.5366	0.5423	0.5463	0.5505 (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							
Ent Door			1.9600	1.2000	2.3520		(26a)
Windows			22.1800	1.1450	25.3969		(27)
Roof dome			2.8000	1.1450	3.2061		(27a)
GP Door			1.9600	1.2000	2.3520		(26)
Rooflights			1.2200	1.1450	1.3969		(27a)
Heatloss Floor 1			77.7000	0.1200	9.3240	75.0000	5827.5000 (28a)
Brick	166.2200	16.0300	150.1900	0.2000	30.0380	60.0000	9011.4000 (29a)
Cladding	29.5200	10.0700	19.4500	0.1900	3.6955	60.0000	1167.0000 (29a)
Ashlar wall	26.2500		26.2500	0.1600	4.2000	9.0000	236.2500 (29a)
Planned Roof	36.2000		36.2000	0.0900	3.2580	9.0000	325.8000 (30)
Sloped Roof	42.1800	1.2200	40.9600	0.1481	6.0681	9.0000	368.6400 (30)
Flat Roof	19.8000	2.8000	17.0000	0.1500	2.5500	9.0000	153.0000 (30)
Total net area of external elements A _{um} (A, m ²)			397.8700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	93.8376		(33)
Main dwelling							
Internal Wall 1			223.9600			9.0000	2015.6400 (32c)
Internal Floor 1			35.7000			18.0000	642.6000 (32d)
Internal Floor 2			57.9000			18.0000	1042.2000 (32d)

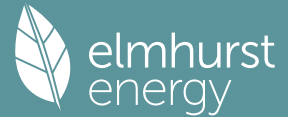
4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.9643 (42)
Hot water usage for mixer showers												
	73.9216	72.8107	71.1919	68.0946	65.8089	63.2599	61.8111	63.4176	65.1787	67.9155	71.0793	73.6384 (42a)
Hot water usage for baths												
	31.9119	31.4380	30.7706	29.5400	28.6186	27.5969	27.0450	27.7077	28.4293	29.5226	30.7785	31.8040 (42b)
Hot water usage for other uses												
	44.9875	43.3516	41.7157	40.0798	38.4439	36.8080	36.8080	38.4439	40.0798	41.7157	43.3516	44.9875 (42c)
Average daily hot water use (litres/day)												138.6384 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
	150.8210	147.6003	143.6782	137.7144	132.8714	127.6647	125.6640	129.5692	133.6878	139.1538	145.2094	150.4299 (44)
Energy content (annual)												
	238.8636	210.1808	220.8280	188.5242	178.8704	156.9787	151.9797	160.4337	164.8504	188.8304	206.8774	235.5369 (45)
Distribution loss (46)m = 0.15 x (45)m												
	35.8295	31.5271	33.1242	28.2786	26.8306	23.5468	22.7970	24.0651	24.7276	28.3246	31.0316	35.3305 (46)
Water storage loss:												
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.1000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.5940 (55)
Total storage loss												
	18.4140	16.6320	18.4140	17.8200	18.4140	17.8200	18.4140	18.4140	17.8200	18.4140	17.8200	18.4140 (56)
If cylinder contains dedicated solar storage												
	18.4140	16.6320	18.4140	17.8200	18.4140	17.8200	18.4140	18.4140	17.8200	18.4140	17.8200	18.4140 (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												
	280.5400	247.8240	262.5044	228.8562	220.5468	197.3107	193.6561	202.1101	205.1824	230.5068	247.2094	277.2133 (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												
	280.5400	247.8240	262.5044	228.8562	220.5468	197.3107	193.6561	202.1101	205.1824	230.5068	247.2094	277.2133 (64)
Total per year (kWh/year)												2793.4602 (64)
Electric shower(s)												2793 (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												
	112.7633	99.9997	106.7664	94.9499	92.8155	84.4610	83.8744	86.6853	87.0783	96.1272	101.0523	111.6571 (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	148.2155	148.2155	148.2155	148.2155	148.2155	148.2155	148.2155	148.2155	148.2155	148.2155	148.2155	148.2155	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	180.9328	200.3185	180.9328	186.9639	180.9328	186.9639	180.9328	180.9328	186.9639	180.9328	186.9639	180.9328	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	342.8732	346.4311	337.4652	318.3778	294.2834	271.6381	256.5096	252.9517	261.9176	281.0050	305.0994	327.7447	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.8216	37.8216	37.8216	37.8216	37.8216	37.8216	37.8216	37.8216	37.8216	37.8216	37.8216	37.8216	(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)	-118.5724	-118.5724	-118.5724	-118.5724	-118.5724	-118.5724	-118.5724	-118.5724	-118.5724	-118.5724	-118.5724	-118.5724	(71)
Water heating gains (Table 5)	151.5635	148.8091	143.5033	131.8748	124.7521	117.3070	112.7344	116.5125	120.9421	129.2033	140.3505	150.0768	(72)
Total internal gains	742.8342	763.0234	729.3660	704.6813	667.4330	643.3737	617.6415	617.8617	637.2883	658.6057	699.8785	726.2190	(73)

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[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	6.6200		19.6403		0.5100		0.0000		0.7700		51.0593 (76)	
South	0.8300		46.7521		0.5100		0.0000		0.7700		15.2384 (78)	
West	14.7300		19.6403		0.5100		0.0000		0.7700		113.6085 (80)	
Horizontal	2.8000		26.0000		0.6300		0.7000		1.0000		28.8943 (82)	
North	1.2200		26.0000		0.6300		0.7000		1.0000		12.5897 (82)	

Solar gains	221.3892	433.2389	715.4530	1048.9502	1291.9702	1325.7764	1260.8480	1078.4649	833.6786	514.4499	276.0356	182.0877 (83)
Total gains	964.2235	1196.2622	1444.8190	1753.6315	1959.4031	1969.1501	1878.4894	1696.3266	1470.9670	1173.0556	975.9141	908.3067 (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	32.4365	32.4930	32.5486	32.8123	32.8621	33.0960	33.0960	33.1397	33.0055	32.8621	32.7615	32.6570
alpha	3.1624	3.1662	3.1699	3.1875	3.1908	3.2064	3.2064	3.2093	3.2004	3.1908	3.1841	3.1771
util living area	0.9826	0.9659	0.9294	0.8416	0.7050	0.5401	0.4091	0.4647	0.6988	0.9055	0.9705	0.9855 (86)
Living	19.2135	19.4681	19.8518	20.3188	20.6513	20.8261	20.8800	20.8679	20.7232	20.2401	19.6381	19.1708
Non living	17.9047	18.2282	18.7107	19.2854	19.6678	19.8529	19.8982	19.8918	19.7588	19.2062	18.4523	17.8546
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	20.0861	19.4681	19.8518	20.3188	20.6513	20.8261	20.8800	20.8679	20.7232	20.2401	19.6381	19.4267 (87)
Th 2	20.0160	20.0175	20.0191	20.0262	20.0275	20.0337	20.0337	20.0349	20.0313	20.0275	20.0248	20.0220 (88)
util rest of house	0.9795	0.9599	0.9171	0.8149	0.6584	0.4722	0.3254	0.3769	0.6343	0.8832	0.9643	0.9829 (89)
MIT 2	19.1743	18.2282	18.7107	19.2854	19.6678	19.8529	19.8982	19.8918	19.7588	19.2062	18.4523	18.2452 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	19.2648	18.3512	18.8240	19.3880	19.7654	19.9495	19.9956	19.9887	19.8545	19.3088	18.5700	18.3624 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2648	18.3512	18.8240	19.3880	19.7654	19.9495	19.9956	19.9887	19.8545	19.3088	18.5700	18.3624 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9766	0.9463	0.8981	0.7946	0.6446	0.4659	0.3219	0.3725	0.6212	0.8625	0.9516	0.9768 (94)
Useful gains	941.6574	1132.0730	1297.6550	1393.4456	1263.1251	917.4714	604.7787	631.8515	913.6994	1011.7566	928.6749	887.2597 (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	2772.2911	2487.5634	2275.2104	1920.6920	1474.8082	971.2707	616.5212	650.7121	1047.6771	1592.4428	2103.7906	2605.9380 (97)
Space heating kWh	1361.9915	910.8895	727.3013	379.6174	157.4923	0.0000	0.0000	0.0000	0.0000	432.0305	846.0833	1278.6966 (98a)
Space heating requirement - total per year (kWh/year)												6094.1024
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	1361.9915	910.8895	727.3013	379.6174	157.4923	0.0000	0.0000	0.0000	0.0000	432.0305	846.0833	1278.6966 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6094.1024
Space heating per m2										(98c) / (4) =		35.5756 (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 %)												281.6673 (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	1361.9915	910.8895	727.3013	379.6174	157.4923	0.0000	0.0000	0.0000	0.0000	432.0305	846.0833	1278.6966 (98)
Space heating efficiency (main heating system 1)	281.6673	281.6673	281.6673	281.6673	281.6673	0.0000	0.0000	0.0000	0.0000	281.6673	281.6673	281.6673 (210)
Space heating fuel (main heating system)	483.5462	323.3920	258.2129	134.7751	55.9143	0.0000	0.0000	0.0000	0.0000	153.3833	300.3839	453.9741 (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	280.5400	247.8240	262.5044	228.8562	220.5468	197.3107	193.6561	202.1101	205.1824	230.5068	247.2094	277.2133 (64)
Efficiency of water heater												177.3522 (216)
(217)m	177.3522	177.3522	177.3522	177.3522	177.3522	177.3522	177.3522	177.3522	177.3522	177.3522	177.3522	177.3522 (217)
Fuel for water heating, kWh/month	158.1824	139.7355	148.0130	129.0405	124.3552	111.2536	109.1929	113.9597	115.6920	129.9712	139.3890	156.3066 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	47.6471	38.2243	34.4167	25.2152	19.4769	15.9128	17.7675	23.0949	29.9979	39.3589	44.4558	48.9714 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												

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(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												2163.5818	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												177.3522	
Water heating fuel used												1575.0916	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												384.5393	(232)
Energy saving/generation technologies (Appendices M, N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												4123.2127	(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 (high-rate cost)	1730.8654	0.1634	282.8360	(261)
Space heating - main system 1 (low-rate cost)	432.7164	0.1372	59.3602	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating - high rate cost	1102.5641	0.1480	163.2035	(264)
Water heating - low rate cost	472.5275	0.1242	58.7028	(264)
Space and water heating			564.1025	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	384.5393	0.1490	57.3040	(268)
Total CO2, kg/year			621.4064	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.6300	(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 (high-rate cost)	1730.8654	1.2873	2785.1843	(275)
Space heating - main system 1 (low-rate cost)	432.7164	1.4966	647.5869	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating - high rate cost	1102.5641	1.5533	1712.6082	(278)
Water heating - low rate cost	472.5275	1.4446	682.6210	(278)
Space and water heating			5828.0005	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	384.5393	1.5547	597.8604	(282)
Total Primary energy kWh/year			6425.8609	(286)
Dwelling Primary energy Rate (DPER)			37.5100	(287)

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

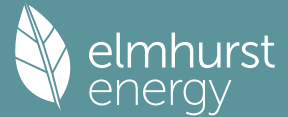
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	77.7000 (1b)	x 2.4000 (2b)	= 186.4800 (1b) - (3b)	
First floor	57.9000 (1c)	x 2.6000 (2c)	= 150.5400 (1c) - (3c)	
Second floor	35.7000 (1d)	x 2.4000 (2d)	= 85.6800 (1d) - (3d)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	171.3000			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 422.7000	(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) =	0.0946 (8)
Pressure test		Yes
Pressure Test Method		Blower Door

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Measured/design AP50 5.0000 (17)
Infiltration rate 0.3446 (18)
Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.2929 (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)
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	0.3735	0.3662	0.3588	0.3222	0.3149	0.2783	0.2783	0.2710	0.2929	0.3149	0.3296	0.3442 (22b)
	0.5697	0.5670	0.5644	0.5519	0.5496	0.5387	0.5387	0.5367	0.5429	0.5496	0.5543	0.5592 (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			1.9600	1.0000	1.9600		(26)
TER Semi-glazed door			1.9600	1.0000	1.9600		(26a)
TER Opening Type			22.1800	1.1450	25.3969		(27)
TER Roof Window			1.2200	1.1450	1.9419		(27a)
TER Roof Light			2.8000	1.5918	5.6618		(27a)
Heatloss Floor 1			77.7000	0.1300	10.1010		(28a)
Brick	166.2200	16.0300	150.1900	0.1800	27.0342		(29a)
Cladding	29.5200	10.0700	19.4500	0.1800	3.5010		(29a)
Ashlar wall	26.2500		26.2500	0.1800	4.7250		(29a)
Planed Roof	36.2000		36.2000	0.1100	3.9820		(30)
Sloped Roof	42.1800	1.2200	40.9600	0.1100	4.5056		(30)
Flat Roof	19.8000	2.8000	17.0000	0.1100	1.8700		(30)
Total net area of external elements Aum(A, m2)			397.8700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	92.6395		(33)

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

126.2839 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	34.4000	0.0900	3.0960
E17 Corner (inverted - internal area greater than external area)	3.0000	-0.0900	-0.2700
E13 Gable (insulation at rafter level)	13.6000	0.0800	1.0880
E10 Eaves (insulation at ceiling level)	13.9000	0.0600	0.8340
E2 Other lintels (including other steel lintels)	15.1200	0.0500	0.7560
E3 Sill	14.1900	0.0500	0.7095
E4 Jamb	26.7000	0.0500	1.3350
E5 Ground floor (normal)	37.0000	0.1600	5.9200
E6 Intermediate floor within a dwelling	30.9300	0.0000	0.0000
R1 Head of roof window	1.5600	0.0800	0.1248
R2 Sill of roof window	1.5600	0.0600	0.0936
R3 Jamb of roof window	3.1200	0.0800	0.2496
E12 Gable (insulation at ceiling level)	5.6000	0.0600	0.3360
R11 Upstands or kerbs of rooflights	8.6000	0.0800	0.6880

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

14.9605 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 107.6000 (37)

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

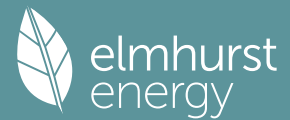
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	79.4748	79.0970	78.7266	76.9873	76.6618	75.1469	75.1469	74.8664	75.7304	76.6618	77.3202	78.0085 (38)
Average = Sum(39)m / 12 =	187.0747	186.6969	186.3266	184.5872	184.2618	182.7469	182.7469	182.4663	183.3304	184.2618	184.9201	185.6084 (39)
												184.5857

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0921	1.0899	1.0877	1.0776	1.0757	1.0668	1.0668	1.0652	1.0702	1.0757	1.0795	1.0835 (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													2.9643 (42)
Hot water usage for mixer showers	73.9216	72.8107	71.1919	68.0946	65.8089	63.2599	61.8111	63.4176	65.1787	67.9155	71.0793	73.6384 (42a)	
Hot water usage for baths	31.9119	31.4380	30.7706	29.5400	28.6186	27.5969	27.0450	27.7077	28.4293	29.5226	30.7785	31.8040 (42b)	
Hot water usage for other uses	44.9875	43.3516	41.7157	40.0798	38.4439	36.8080	36.8080	38.4439	40.0798	41.7157	43.3516	44.9875 (42c)	
Average daily hot water use (litres/day)												138.6384 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	150.8210	147.6003	143.6782	137.7144	132.8714	127.6647	125.6640	129.5692	133.6878	139.1538	145.2094	150.4299 (44)	
Energy conte	238.8636	210.1808	220.8280	188.5242	178.8704	156.9787	151.9797	160.4337	164.8504	188.8304	206.8774	235.5369 (45)	
Energy content (annual)										Total =	Sum(45)m =	2302.7542	
Distribution loss (46)m = 0.15 x (45)m	35.8295	31.5271	33.1242	28.2786	26.8306	23.5468	22.7970	24.0651	24.7276	28.3246	31.0316	35.3305 (46)	
Water storage loss:													
Store volume												250.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.8903 (48)	
Temperature factor from Table 2b												0.5400 (49)	
Enter (49) or (54) in (55)												1.0208 (55)	
Total storage loss	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444 (56)	
If cylinder contains dedicated solar storage	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444 (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	293.7704	259.7741	275.7348	241.6598	233.7772	210.1143	206.8865	215.3405	217.9860	243.7372	260.0130	290.4437 (62)	
WWHRS	-33.7939	-29.8876	-31.2965	-25.9148	-24.1516	-20.6667	-19.3718	-20.5999	-21.3826	-25.2077	-28.5573	-33.1681 (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	259.9766	229.8865	244.4383	215.7450	209.6255	189.4476	187.5147	194.7406	196.6034	218.5295	231.4558	257.2756 (64)	

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12Total per year (kWh/year)											Total per year (kWh/year) = Sum(64)m = 2635.2389 (64)	
Electric shower(s)											2635 (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												
123.3476	109.5597	117.3507	105.1928	103.3998	94.7039	94.4587	97.2696	97.3212	106.7115	111.2952	122.2415 (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	148.2155	148.2155	148.2155	148.2155	148.2155	148.2155	148.2155	148.2155	148.2155	148.2155	148.2155	148.2155	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	180.9328	200.3185	180.9328	186.9639	180.9328	186.9639	180.9328	180.9328	186.9639	180.9328	186.9639	180.9328	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	342.8732	346.4311	337.4652	318.3778	294.2834	271.6381	256.5096	252.9517	261.9176	281.0050	305.0994	327.7447	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.8216	37.8216	37.8216	37.8216	37.8216	37.8216	37.8216	37.8216	37.8216	37.8216	37.8216	37.8216	(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)	-118.5724	-118.5724	-118.5724	-118.5724	-118.5724	-118.5724	-118.5724	-118.5724	-118.5724	-118.5724	-118.5724	-118.5724	(71)
Water heating gains (Table 5)	165.7898	163.0353	157.7295	146.1011	138.9783	131.5332	126.9606	130.7388	135.1684	143.4295	154.5767	164.3030	(72)
Total internal gains	760.0605	780.2496	746.5922	721.9075	684.6592	657.5999	631.8677	632.0879	651.5146	675.8320	717.1047	743.4452	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
East	6.6200	19.6403	0.6300	0.7000	0.7700	39.7354 (76)
South	0.8300	46.7521	0.6300	0.7000	0.7700	11.8591 (78)
West	14.7300	19.6403	0.6300	0.7000	0.7700	88.4142 (80)
North	1.2200	26.0000	0.6300	0.7000	1.0000	12.5897 (82)
Horizontal	2.8000	26.0000	0.6300	0.7000	1.0000	28.8943 (82)

Solar gains	181.4926	356.2688	590.7588	869.4052	1073.3929	1102.5328	1048.1110	894.8514	689.4891	423.7161	226.4972	149.1376	(83)
Total gains	941.5531	1136.5184	1337.3511	1591.3127	1758.0521	1760.1327	1679.9787	1526.9393	1341.0036	1099.5481	943.6019	892.5828	(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	32.1209	32.1859	32.2499	32.5538	32.6113	32.8816	32.8816	32.9322	32.7769	32.6113	32.4952	32.3747
alpha	3.1414	3.1457	3.1500	3.1703	3.1741	3.1921	3.1921	3.1955	3.1851	3.1741	3.1663	3.1583
util living area	0.9837	0.9703	0.9417	0.8703	0.7506	0.5907	0.4537	0.5099	0.7384	0.9189	0.9731	0.9862 (86)
MIT	18.7009	19.0080	19.4893	20.1084	20.5858	20.8631	20.9559	20.9359	20.7106	20.0476	19.2651	18.6529 (87)
Th 2	20.0073	20.0091	20.0109	20.0192	20.0208	20.0280	20.0280	20.0294	20.0252	20.0208	20.0176	20.0143 (88)
util rest of house	0.9808	0.9650	0.9311	0.8467	0.7061	0.5202	0.3627	0.4162	0.6758	0.8989	0.9674	0.9837 (89)
MIT 2	17.3027	17.6934	18.3009	19.0685	19.6270	19.9248	20.0049	19.9931	19.7819	19.0124	18.0289	17.2457 (90)
Living area fraction	17.4414	17.8238	18.4189	19.1717	19.7222	20.0179	20.0992	20.0867	19.8741	19.1151	18.1516	17.3854 (91)
MIT	17.4414	17.8238	18.4189	19.1717	19.7222	20.0179	20.0992	20.0867	19.8741	19.1151	18.1516	17.3854 (92)
Temperature adjustment												0.0000
adjusted MIT	17.4414	17.8238	18.4189	19.1717	19.7222	20.0179	20.0992	20.0867	19.8741	19.1151	18.1516	17.3854 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9692	0.9482	0.9083	0.8221	0.6909	0.5194	0.3697	0.4220	0.6648	0.8748	0.9515	0.9733	(94)
Useful gains	912.5129	1077.6205	1214.7398	1308.2245	1214.6934	914.2786	621.0084	644.3706	891.5134	961.9131	897.8067	868.7736	(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	2458.4314	2412.8370	2220.7999	1896.0248	1478.1827	990.1097	639.4746	672.6937	1058.5705	1569.0160	2043.6630	2447.3141	(97)
Space heating kWh	1150.1633	897.2655	748.5087	423.2162	196.0361	0.0000	0.0000	0.0000	0.0000	451.6846	825.0166	1174.4341	(98a)
Space heating requirement - total per year (kWh/year)												5866.3250	
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	1150.1633	897.2655	748.5087	423.2162	196.0361	0.0000	0.0000	0.0000	0.0000	451.6846	825.0166	1174.4341	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5866.3250	
Space heating per m2												(98c) / (4) =	34.2459 (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	1150.1633	897.2655	748.5087	423.2162	196.0361	0.0000	0.0000	0.0000	0.0000	451.6846	825.0166	1174.4341	(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)

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Space heating fuel (main heating system)	1246.1141	972.1186	810.9520	458.5224	212.3901	0.0000	0.0000	0.0000	0.0000	489.3658	893.8424	1272.4097	(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	259.9766	229.8865	244.4383	215.7450	209.6255	189.4476	187.5147	194.7406	196.6034	218.5295	231.4558	257.2756	(64)
Efficiency of water heater	86.9912	86.8033	86.4012	85.5425	83.9097	79.8000	79.8000	79.8000	79.8000	85.6503	86.6588	79.8000	(216)
Fuel for water heating, kWh/month	298.8538	264.8360	282.9109	252.2080	249.8227	237.4029	234.9809	244.0358	246.3701	255.1414	267.0887	295.5966	(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	7.0685	7.3041	7.0685	7.3041	7.0685	(231)
Lighting	37.5943	30.1595	27.1553	19.8951	15.3676	12.5554	14.0188	18.2222	23.6688	31.0548	35.0763	38.6391	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-68.1818	-93.8930	-131.8073	-144.5264	-152.6829	-141.2298	-139.3096	-132.9442	-121.4114	-105.4449	-74.0895	-59.1971	(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)	-45.5863	-94.9992	-187.2593	-279.0963	-367.0792	-368.2749	-364.1000	-309.3072	-227.9733	-135.3223	-60.6699	-36.1315	(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												6355.7151	(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												3129.2478	(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)												303.4073	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3840.5172	(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												6033.8530	(238)

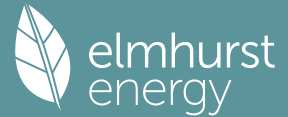
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	6355.7151	0.2100	1334.7002 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3129.2478	0.2100	657.1420 (264)
Space and water heating			1991.8422 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	303.4073	0.1443	43.7910 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1364.7179	0.1351	-184.4145
PV Unit electricity exported	-2475.7993	0.1261	-312.2326
Total			-496.6471 (269)
Total CO2, kg/year			1550.9154 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.0500 (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	6355.7151	1.1300	7181.9581 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3129.2478	1.1300	3536.0500 (278)
Space and water heating			10718.0081 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	303.4073	1.5338	465.3762 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1364.7179	1.4994	-2046.3242
PV Unit electricity exported	-2475.7993	0.4629	-1146.1307
Total			-3192.4549 (283)
Total Primary energy kWh/year			8121.0302 (286)
Target Primary Energy Rate (TPER)			47.4100 (287)

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Property Reference	P14 Ladds			Issued on Date	21/08/2025
Assessment Reference	Detached	Prop Type Ref	Semi		
Property	1, Bath Road, Hare Hatch, Berkshire, RG10 9SA				
SAP Rating	81 B	DER	3.63	TER	9.05
Environmental	96 A	% DER < TER			59.89
CO ₂ Emissions (t/year)	0.56	DFEE	38.16	TFEE	40.01
Compliance Check	See BREL	% DFEE < TFEE			4.61
% DPER < TPER	20.88	DPER	37.51	TPER	47.41
Assessor Details	Mrs. Rebecca Lennon			Assessor ID	P627-0001
Client					

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	77.7000 (1b)	x 2.4000 (2b)	= 186.4800 (1b) - (3b)
First floor	57.9000 (1c)	x 2.6000 (2c)	= 150.5400 (1c) - (3c)
Second floor	35.7000 (1d)	x 2.4000 (2d)	= 85.6800 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	171.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	422.7000 (5)

2. Ventilation rate

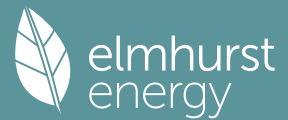
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	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) = 0.0946 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.2946 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2504 (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	0.3193	0.3130	0.3068	0.2755	0.2692	0.2379	0.2379	0.2317	0.2504	0.2692	0.2817	0.2943 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5510	0.5490	0.5471	0.5379	0.5362	0.5283	0.5283	0.5268	0.5314	0.5362	0.5397	0.5433 (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							
Ent Door			1.9600	1.2000	2.3520		(26a)
Windows			22.1800	1.1450	25.3969		(27)
Roof dome			2.8000	1.1450	3.2061		(27a)
GP Door			1.9600	1.2000	2.3520		(26)
Rooflights			1.2200	1.1450	1.3969		(27a)
Heatloss Floor 1			77.7000	0.1200	9.3240	75.0000	5827.5000 (28a)
Brick	166.2200	16.0300	150.1900	0.2000	30.0380	60.0000	9011.4000 (29a)
Cladding	29.5200	10.0700	19.4500	0.1900	3.6955	60.0000	1167.0000 (29a)
Ashlar wall	26.2500		26.2500	0.1600	4.2000	9.0000	236.2500 (29a)
Planned Roof	36.2000		36.2000	0.0900	3.2580	9.0000	325.8000 (30)
Sloped Roof	42.1800	1.2200	40.9600	0.1481	6.0681	9.0000	368.6400 (30)
Flat Roof	19.8000	2.8000	17.0000	0.1500	2.5500	9.0000	153.0000 (30)
Total net area of external elements Aum(A, m ²)			397.8700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	93.8376		(33)
Main dwelling							
Internal Wall 1			223.9600			9.0000	2015.6400 (32c)

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Internal Floor 1	35.7000	18.0000	642.6000 (32d)
Internal Floor 2	57.9000	18.0000	1042.2000 (32d)
Internal Ceiling 1	57.9000	9.0000	521.1000 (32e)
Internal Ceiling 2	35.7000	9.0000	321.3000 (32e)
Heat capacity Cm = Sum(A x k)			
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K			
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E16 Corner (normal)	34.4000	0.0570	1.9608
E17 Corner (inverted - internal area greater than external area)	3.0000	-0.0510	-0.1530
E13 Gable (insulation at rafter level)	13.6000	0.0980	1.3328
E10 Eaves (insulation at ceiling level)	13.9000	0.0840	1.1676
E2 Other lintels (including other steel lintels)	15.1200	0.0480	0.7258
E3 Sill	14.1900	0.0450	0.6385
E4 Jamb	26.7000	0.0510	1.3617
E5 Ground floor (normal)	37.0000	0.0640	2.3680
E6 Intermediate floor within a dwelling	30.9300	0.0000	0.0000
R1 Head of roof window	1.5600	0.2400	0.3744
R2 Sill of roof window	1.5600	0.2400	0.3744
R3 Jamb of roof window	3.1200	0.2400	0.7488
E12 Gable (insulation at ceiling level)	5.6000	0.0730	0.4088
R11 Upstands or kerbs of rooflights	8.6000	0.2400	2.0640
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			13.3726 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	107.2103 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)			
(38)m	Jan	Feb	Mar
Heat transfer coeff	76.8565	76.5803	76.3097
Average = Sum(39)m / 12 =	184.0667	183.7906	183.5199
	Apr	May	Jun
	75.0384	74.8005	73.6933
	182.2486	182.0108	180.9036
	Jul	Aug	Sep
	73.6933	73.4882	74.1198
	180.9036	180.6985	181.3300
	Oct	Nov	Dec
	74.8005	75.2817	75.7847 (38)
	182.0108	182.4920	182.9950 (39)
	182.2475		
HLP	Jan	Feb	Mar
HLP (average)	1.0745	1.0729	1.0713
Days in mont	31	28	31
	Apr	May	Jun
	1.0639	1.0625	1.0561
	30	31	30
	Jul	Aug	Sep
	1.0561	1.0549	1.0586
	31	31	30
	Oct	Nov	Dec
	1.0625	1.0653	1.0683 (40)
	30	30	1.0639
			31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9643 (42)
Hot water usage for mixer showers												
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 (42a)
Hot water usage for baths												
31.9119	31.4380	30.7706	29.5400	28.6186	27.5969	27.0450	27.7077	28.4293	29.5226	30.7785	31.8040	(42b)
Hot water usage for other uses												
44.9875	43.3516	41.7157	40.0798	38.4439	36.8080	36.8080	38.4439	40.0798	41.7157	43.3516	44.9875	(42c)
Average daily hot water use (litres/day)												70.4851 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
76.8994	74.7896	72.4863	69.6198	67.0624	64.4048	63.8529	66.1516	68.5091	71.2383	74.1301	76.7915	(44)
Energy content (annual)	121.7899	106.4994	111.4087	95.3060	90.2789	79.1932	77.2246	81.9095	84.4785	96.6697	105.6119	120.2370 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1170.6073
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:												
Total storage loss												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month												
103.5214	90.5245	94.6974	81.0101	76.7371	67.3142	65.6409	69.6230	71.8068	82.1692	89.7701	102.2015 (62)	
WWHRS	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	(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	103.5214	90.5245	94.6974	81.0101	76.7371	67.3142	65.6409	69.6230	71.8068	82.1692	89.7701	102.2015 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		995.0162 (64)
Electric shower(s)	59.1989	52.7467	57.5974	54.9645	55.9958	53.4146	55.1951	55.9958	54.9645	57.5974	56.5143	59.1989 (64a)
												673.3838 (64a)
Heat gains from water heating, kWh/month												
40.6801	35.8178	38.0737	33.9936	33.1832	30.1822	30.2090	31.4047	31.6928	34.9416	36.5711	40.3501 (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	148.2155	148.2155	148.2155	148.2155	148.2155	148.2155	148.2155	148.2155	148.2155	148.2155	148.2155	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	180.9328	200.3185	180.9328	186.9639	180.9328	186.9639	180.9328	180.9328	186.9639	180.9328	186.9639	180.9328 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	342.8732	346.4311	337.4652	318.3778	294.2834	271.6381	256.5096	252.9517	261.9176	281.0050	305.0994	327.7447 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.8216	37.8216	37.8216	37.8216	37.8216	37.8216	37.8216	37.8216	37.8216	37.8216	37.8216	37.8216 (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)	-118.5724	-118.5724	-118.5724	-118.5724	-118.5724	-118.5724	-118.5724	-118.5724	-118.5724	-118.5724	-118.5724	-118.5724 (71)
Water heating gains (Table 5)	54.6775	53.3003	51.1743	47.2134	44.6011	41.9197	40.6035	42.2106	44.0178	46.9646	50.7932	54.2340 (72)
Total internal gains	645.9482	667.5146	637.0370	620.0198	587.2821	567.9864	545.5106	543.5598	560.3640	576.3671	610.3212	630.3762 (73)

6. Solar gains

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[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	6.6200	19.6403	0.5100	0.0000	0.7700	51.0583 (76)
South	0.8300	46.7521	0.5100	0.0000	0.7700	15.2384 (78)
West	14.7300	19.6403	0.5100	0.0000	0.7700	113.6085 (80)
Horizontal	2.8000	26.0000	0.6300	0.7000	1.0000	28.8943 (82)
North	1.2200	26.0000	0.6300	0.7000	1.0000	12.5897 (82)

Solar gains	221.3892	433.2389	715.4530	1048.9502	1291.9702	1325.7764	1260.8480	1078.4649	833.6786	514.4499	276.0356	182.0877 (83)
Total gains	867.3374	1100.7535	1352.4900	1668.9700	1879.2522	1893.7628	1806.3586	1622.0247	1394.0426	1090.8169	886.3568	812.4639 (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	32.6458	32.6949	32.7431	32.9715	33.0146	33.2166	33.2166	33.2543	33.1385	33.0146	32.9275	32.8370
alpha	3.1764	3.1797	3.1829	3.1981	3.2010	3.2144	3.2144	3.2170	3.2092	3.2010	3.1952	3.1891
util living area	0.9870	0.9725	0.9394	0.8553	0.7207	0.5555	0.4224	0.4815	0.7197	0.9195	0.9771	0.9894 (86)
MIT	18.6676	19.0129	19.5362	20.1795	20.6429	20.8881	20.9651	20.9469	20.7380	20.0606	19.2382	18.6077 (87)
Th 2	20.0217	20.0230	20.0243	20.0304	20.0316	20.0369	20.0369	20.0379	20.0348	20.0316	20.0292	20.0268 (88)
util rest of house	0.9847	0.9676	0.9285	0.8301	0.6749	0.4869	0.3368	0.3918	0.6564	0.8997	0.9722	0.9875 (89)
MIT 2	17.8765	18.2191	18.7334	19.3520	19.7697	19.9719	20.0227	20.0147	19.8645	19.2555	18.4497	17.8205 (90)
Living area fraction	17.9550	18.2979	18.8131	19.4341	19.8563	20.0628	20.1163	20.1072	fLA = Living area / (4) =			0.0992 (91)
MIT	17.9550	18.2979	18.8131	19.4341	19.8563	20.0628	20.1163	20.1072	19.9512	19.3354	18.5279	17.8986 (92)
Temperature adjustment												0.0000
adjusted MIT	17.9550	18.2979	18.8131	19.4341	19.8563	20.0628	20.1163	20.1072	19.9512	19.3354	18.5279	17.8986 (93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9774	0.9557	0.9113	0.8121	0.6659	0.4889	0.3441	0.3986	0.6503	0.8817	0.9616	0.9812 (94)
Useful gains	847.7594	1052.0188	1232.4758	1355.4447	1251.3252	925.8083	621.5361	646.4637	906.4805	961.7948	852.3083	797.2200 (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	2513.4320	2462.4086	2259.7011	1919.8238	1484.5437	988.2450	636.1022	669.8908	1060.9973	1589.9301	2085.5013	2506.7723 (97)
Space heating kWh	1239.2604	947.7820	764.2556	406.3530	173.5145	0.0000	0.0000	0.0000	0.0000	467.3327	887.8990	1271.9068 (98a)
Space heating requirement - total per year (kWh/year)												6158.3040
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	1239.2604	947.7820	764.2556	406.3530	173.5145	0.0000	0.0000	0.0000	0.0000	467.3327	887.8990	1271.9068 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6158.3040
Space heating per m2										(98c) / (4) =		35.9504 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

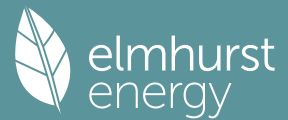
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1700.4934	1338.6863	1373.3087	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8322	0.8859	0.8501	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1415.1473	1185.9018	1167.4284	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2073.9505	1978.4022	1775.2730	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	474.3383	589.6203	452.2364	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	118.5846	147.4051	113.0591	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												379.0487 (107)
Energy for space heating												35.9504 (99)
Energy for space cooling												2.2128 (108)
Total												38.1632 (109)
Fabric Energy Efficiency (DFEE)												38.2 (109)

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

1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	77.7000 (1b)	x 2.4000 (2b)	= 186.4800 (1b) - (3b)
First floor	57.9000 (1c)	x 2.6000 (2c)	= 150.5400 (1c) - (3c)
Second floor	35.7000 (1d)	x 2.4000 (2d)	= 85.6800 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	171.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	422.7000 (5)

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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) =	0.0946 (8)
Pressure test												Yes		
Pressure Test Method												Blower Door		
Measured/design AP50												5.0000 (17)		
Infiltration rate												0.3446 (18)		
Number of sides sheltered												2 (19)		
Shelter factor												(20) = 1 - [0.075 x (19)] =	0.8500 (20)	
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) =	0.2929 (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	0.3735	0.3662	0.3588	0.3222	0.3149	0.2783	0.2783	0.2710	0.2929	0.3149	0.3296	0.3442	(22b)	
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)	
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)	
Effective ac	0.5697	0.5670	0.5644	0.5519	0.5496	0.5387	0.5387	0.5367	0.5429	0.5496	0.5543	0.5592	(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			1.9600	1.0000	1.9600			(26)
TER Semi-glazed door			1.9600	1.0000	1.9600			(26a)
TER Opening Type			22.1800	1.1450	25.3969			(27)
TER Roof Window			1.2200	1.1450	1.9419			(27a)
TER Roof Light			2.8000	1.5918	5.6618			(27a)
Heatloss Floor 1			77.7000	0.1300	10.1010			(28a)
Brick	166.2200	16.0300	150.1900	0.1800	27.0342			(29a)
Cladding	29.5200	10.0700	19.4500	0.1800	3.5010			(29a)
Ashlar wall	26.2500		26.2500	0.1800	4.7250			(29a)
Planed Roof	36.2000		36.2000	0.1100	3.9820			(30)
Sloped Roof	42.1800	1.2200	40.9600	0.1100	4.5056			(30)
Flat Roof	19.8000	2.8000	17.0000	0.1100	1.8700			(30)
Total net area of external elements Aum(A, m2)			397.8700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	92.6395			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							126.2839	(35)
List of Thermal Bridges								
K1 Element				Length	Psi-value		Total	
E16 Corner (normal)				34.4000	0.0900		3.0960	
E17 Corner (inverted - internal area greater than external area)				3.0000	-0.0900		-0.2700	
E13 Gable (insulation at rafter level)				13.6000	0.0800		1.0880	
E10 Eaves (insulation at ceiling level)				13.9000	0.0600		0.8340	
E2 Other lintels (including other steel lintels)				15.1200	0.0500		0.7560	
E3 Sill				14.1900	0.0500		0.7095	
E4 Jamb				26.7000	0.0500		1.3350	
E5 Ground floor (normal)				37.0000	0.1600		5.9200	
E6 Intermediate floor within a dwelling				30.9300	0.0000		0.0000	
R1 Head of roof window				1.5600	0.0800		0.1248	
R2 Sill of roof window				1.5600	0.0600		0.0936	
R3 Jamb of roof window				3.1200	0.0800		0.2496	
E12 Gable (insulation at ceiling level)				5.6000	0.0600		0.3360	
R11 Upstands or kerbs of rooflights				8.6000	0.0800		0.6880	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.9605	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		107.6000	(37)

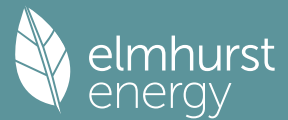
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	79.4748	79.0970	78.7266	76.9873	76.6618	75.1469	75.1469	74.8664	75.7304	76.6618	77.3202	78.0085 (38)
Average = Sum(39)m / 12 =	187.0747	186.6969	186.3266	184.5872	184.2618	182.7469	182.7469	182.4663	183.3304	184.2618	184.9201	185.6084 (39)
												184.5857
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0921	1.0899	1.0877	1.0776	1.0757	1.0668	1.0668	1.0652	1.0702	1.0757	1.0795	1.0835 (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												2.9643 (42)
Hot water usage for mixer showers												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	31.9119	31.4380	30.7706	29.5400	28.6186	27.5969	27.0450	27.7077	28.4293	29.5226	30.7785	31.8040 (42b)
Hot water usage for other uses	44.9875	43.3516	41.7157	40.0798	38.4439	36.8080	36.8080	38.4439	40.0798	41.7157	43.3516	44.9875 (42c)
Average daily hot water use (litres/day)												70.4851 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	76.8994	74.7896	72.4863	69.6198	67.0624	64.4048	63.8529	66.1516	68.5091	71.2383	74.1301	76.7915 (44)

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Energy content (annual)	121.7899	106.4994	111.4087	95.3060	90.2789	79.1932	77.2246	81.9095	84.4785	96.6697	105.6119	120.2370 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1170.6073
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
WWHRS	103.5214	90.5245	94.6974	81.0101	76.7371	67.3142	65.6409	69.6230	71.8068	82.1692	89.7701	102.2015 (62)
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 (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 (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	103.5214	90.5245	94.6974	81.0101	76.7371	67.3142	65.6409	69.6230	71.8068	82.1692	89.7701	102.2015 (64)
12Total per year (kWh/year)												995.0162 (64)
Electric shower(s)	59.1989	52.7467	57.5974	54.9645	55.9958	53.4146	55.1951	55.9958	54.9645	57.5974	56.5143	59.1989 (64a)
Heat gains from water heating, kWh/month	40.6801	35.8178	38.0737	33.9936	33.1832	30.1822	30.2090	31.4047	31.6928	34.9416	36.5711	40.3501 (65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 673.3838 (64a)												

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	148.2155	148.2155	148.2155	148.2155	148.2155	148.2155	148.2155	148.2155	148.2155	148.2155	148.2155	148.2155 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	180.9328	200.3185	180.9328	186.9639	180.9328	186.9639	180.9328	180.9328	186.9639	180.9328	186.9639	180.9328 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	342.8732	346.4311	337.4652	318.3778	294.2834	271.6381	256.5096	252.9517	261.9176	281.0050	305.0994	327.7447 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.8216	37.8216	37.8216	37.8216	37.8216	37.8216	37.8216	37.8216	37.8216	37.8216	37.8216	37.8216 (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)	-118.5724	-118.5724	-118.5724	-118.5724	-118.5724	-118.5724	-118.5724	-118.5724	-118.5724	-118.5724	-118.5724	-118.5724 (71)
Water heating gains (Table 5)	54.6775	53.3003	51.1743	47.2134	44.6011	41.9197	40.6035	42.2106	44.0178	46.9646	50.7932	54.2340 (72)
Total internal gains	645.9482	667.5146	637.0370	620.0198	587.2821	567.9864	545.5106	543.5598	560.3640	576.3671	610.3212	630.3762 (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						6.6200	19.6403		0.6300	0.7000	0.7700		39.7354 (76)
South						0.8300	46.7521		0.6300	0.7000	0.7700		11.8591 (78)
West						14.7300	19.6403		0.6300	0.7000	0.7700		88.4142 (80)
North						1.2200	26.0000		0.6300	0.7000	1.0000		12.5897 (82)
Horizontal						2.8000	26.0000		0.6300	0.7000	1.0000		28.8943 (82)
Solar gains	181.4926	356.2688	590.7588	869.4052	1073.3929	1102.5328	1048.1110	894.8514	689.4891	423.7161	226.4972	149.1376	(83)
Total gains	827.4408	1023.7834	1227.7959	1489.4250	1660.6750	1670.5192	1593.6216	1438.4112	1249.8530	1000.0832	836.8184	779.5138	(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	32.1209	32.1859	32.2499	32.5538	32.6113	32.8816	32.8816	32.9322	32.7769	32.6113	32.4952	32.3747
alpha	3.1414	3.1457	3.1500	3.1703	3.1741	3.1921	3.1921	3.1955	3.1851	3.1741	3.1663	3.1583
util living area	0.9886	0.9775	0.9527	0.8869	0.7722	0.6134	0.4747	0.5350	0.7656	0.9350	0.9805	0.9906 (86)
MIT	18.5877	18.9012	19.3953	20.0412	20.5467	20.8472	20.9498	20.9264	20.6756	19.9684	19.1625	18.5395 (87)
Th 2	20.0073	20.0091	20.0109	20.0192	20.0208	20.0280	20.0280	20.0294	20.0252	20.0208	20.0176	20.0143 (88)
util rest of house	0.9865	0.9733	0.9438	0.8654	0.7292	0.5423	0.3807	0.4387	0.7053	0.9182	0.9762	0.9888 (89)
MIT 2	17.7874	18.0995	18.5878	19.2170	19.6821	19.9374	20.0073	19.9965	19.8095	19.1612	18.3671	17.7443 (90)
Living area fraction	17.8669	18.1790	18.6679	19.2988	19.7679	20.0277	20.1008	20.0888	19.8955	19.2413	18.4461	17.8232 (91)
MIT	17.8669	18.1790	18.6679	19.2988	19.7679	20.0277	20.1008	20.0888	19.8955	19.2413	18.4461	17.8232 (93)
Temperature adjustment												0.0000
adjusted MIT	17.8669	18.1790	18.6679	19.2988	19.7679	20.0277	20.1008	20.0888	19.8955	19.2413	18.4461	17.8232 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	810.7877	985.6008	1139.3136	1260.6910	1190.3381	905.9088	618.5063	640.0832	869.9882	900.8483	808.8185	766.3020 (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	2538.0172	2479.1562	2267.2050	1919.4807	1486.5977	991.8882	639.7602	673.0774	1062.4900	1592.2598	2098.1154	2528.5764 (97)
Space heating kWh	1285.0587	1003.6692	839.1512	474.3286	220.4171	0.0000	0.0000	0.0000	0.0000	514.4101	928.2938	1311.1322 (98a)
Space heating requirement - total per year (kWh/year)												6576.4609
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	1285.0587	1003.6692	839.1512	474.3286	220.4171	0.0000	0.0000	0.0000	0.0000	514.4101	928.2938	1311.1322 (98c)

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Space heating requirement after solar contribution - total per year (kWh/year)
Space heating per m2

6576.4609
(98c) / (4) = 38.3915 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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												
	0.0000	0.0000	0.0000	0.0000	0.0000	1717.8205	1352.3268	1386.7440	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7816	0.8455	0.8045	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1342.5992	1143.3851	1115.6954	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1813.0164	1729.7486	1560.6598	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	338.7004	436.2545	331.0535	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fC = cooled area / (4) =			
Intermittency factor (Table 10b)												1.0000 (105)
	0.2500	0.2500							0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	84.6751	109.0636	82.7634	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												276.5021 (107)
Energy for space heating												38.3915 (99)
Energy for space cooling												1.6141 (108)
Total												40.0056 (109)
Fabric Energy Efficiency (TFEE)												40.0 (109)

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Property Reference	P14 Ladds			Issued on Date	21/08/2025
Assessment Reference	Detached	Prop Type Ref	Semi		
Property	1, Bath Road, Hare Hatch, Berkshire, RG10 9SA				
SAP Rating	81 B	DER	3.63	TER	9.05
Environmental	96 A	% DER < TER			59.89
CO ₂ Emissions (t/year)	0.56	DFEE	38.16	TFEE	40.01
Compliance Check	See BREL	% DFEE < TFEE			4.61
% DPER < TPER	20.88	DPER	37.51	TPER	47.41
Assessor Details	Mrs. Rebecca Lennon			Assessor ID	P627-0001
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	77.7000 (1b)	x 2.4000 (2b)	= 186.4800 (1b) - (3b)
First floor	57.9000 (1c)	x 2.6000 (2c)	= 150.5400 (1c) - (3c)
Second floor	35.7000 (1d)	x 2.4000 (2d)	= 85.6800 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	171.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 422.7000 (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	5 * 10 = 50.0000 (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)	50.0000 / (5) = 0.1183 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3183 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2705 (21)

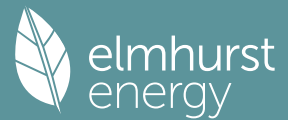
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3449	0.3382	0.3314	0.2976	0.2908	0.2570	0.2570	0.2503	0.2705	0.2908	0.3044	0.3179 (22b)
Effective ac	0.5595	0.5572	0.5549	0.5443	0.5423	0.5330	0.5330	0.5313	0.5366	0.5423	0.5463	0.5505 (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							
Ent Door			1.9600	1.2000	2.3520		(26a)
Windows			22.1800	1.1450	25.3969		(27)
Roof dome			2.8000	1.1450	3.2061		(27a)
GP Door			1.9600	1.2000	2.3520		(26)
Rooflights			1.2200	1.1450	1.3969		(27a)
Heatloss Floor 1			77.7000	0.1200	9.3240	75.0000	5827.5000 (28a)
Brick	166.2200	16.0300	150.1900	0.2000	30.0380	60.0000	9011.4000 (29a)
Cladding	29.5200	10.0700	19.4500	0.1900	3.6955	60.0000	1167.0000 (29a)
Ashlar wall	26.2500		26.2500	0.1600	4.2000	9.0000	236.2500 (29a)
Planned Roof	36.2000		36.2000	0.0900	3.2580	9.0000	325.8000 (30)
Sloped Roof	42.1800	1.2200	40.9600	0.1481	6.0681	9.0000	368.6400 (30)
Flat Roof	19.8000	2.8000	17.0000	0.1500	2.5500	9.0000	153.0000 (30)
Total net area of external elements Aum(A, m ²)			397.8700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	93.8376		(33)
Main dwelling							
Internal Wall 1			223.9600			9.0000	2015.6400 (32c)
Internal Floor 1			35.7000			18.0000	642.6000 (32d)
Internal Floor 2			57.9000			18.0000	1042.2000 (32d)

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.9643 (42)
Hot water usage for mixer showers												
	73.9216	72.8107	71.1919	68.0946	65.8089	63.2599	61.8111	63.4176	65.1787	67.9155	71.0793	73.6384 (42a)
Hot water usage for baths												
	31.9119	31.4380	30.7706	29.5400	28.6186	27.5969	27.0450	27.7077	28.4293	29.5226	30.7785	31.8040 (42b)
Hot water usage for other uses												
	44.9875	43.3516	41.7157	40.0798	38.4439	36.8080	36.8080	38.4439	40.0798	41.7157	43.3516	44.9875 (42c)
Average daily hot water use (litres/day)												138.6384 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
	150.8210	147.6003	143.6782	137.7144	132.8714	127.6647	125.6640	129.5692	133.6878	139.1538	145.2094	150.4299 (44)
Energy content (annual)												
	238.8636	210.1808	220.8280	188.5242	178.8704	156.9787	151.9797	160.4337	164.8504	188.8304	206.8774	235.5369 (45)
Distribution loss (46)m = 0.15 x (45)m												
	35.8295	31.5271	33.1242	28.2786	26.8306	23.5468	22.7970	24.0651	24.7276	28.3246	31.0316	35.3305 (46)
Water storage loss:												
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.1000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.5940 (55)
Total storage loss												
	18.4140	16.6320	18.4140	17.8200	18.4140	17.8200	18.4140	18.4140	17.8200	18.4140	17.8200	18.4140 (56)
If cylinder contains dedicated solar storage												
	18.4140	16.6320	18.4140	17.8200	18.4140	17.8200	18.4140	18.4140	17.8200	18.4140	17.8200	18.4140 (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												
	280.5400	247.8240	262.5044	228.8562	220.5468	197.3107	193.6561	202.1101	205.1824	230.5068	247.2094	277.2133 (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												
	280.5400	247.8240	262.5044	228.8562	220.5468	197.3107	193.6561	202.1101	205.1824	230.5068	247.2094	277.2133 (64)
Total per year (kWh/year)												2793.4602 (64)
Electric shower(s)												2793 (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												
	112.7633	99.9997	106.7664	94.9499	92.8155	84.4610	83.8744	86.6853	87.0783	96.1272	101.0523	111.6571 (65)

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[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	6.6200		19.6403		0.5100		0.0000		0.7700		51.0593 (76)	
South	0.8300		46.7521		0.5100		0.0000		0.7700		15.2384 (78)	
West	14.7300		19.6403		0.5100		0.0000		0.7700		113.6085 (80)	
Horizontal	2.8000		26.0000		0.6300		0.7000		1.0000		28.8943 (82)	
North	1.2200		26.0000		0.6300		0.7000		1.0000		12.5897 (82)	

Solar gains	221.3892	433.2389	715.4530	1048.9502	1291.9702	1325.7764	1260.8480	1078.4649	833.6786	514.4499	276.0356	182.0877 (83)
Total gains	964.2235	1196.2622	1444.8190	1753.6315	1959.4031	1969.1501	1878.4894	1696.3266	1470.9670	1173.0556	975.9141	908.3067 (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	32.4365	32.4930	32.5486	32.8123	32.8621	33.0960	33.0960	33.1397	33.0055	32.8621	32.7615	32.6570
alpha	3.1624	3.1662	3.1699	3.1875	3.1908	3.2064	3.2064	3.2093	3.2004	3.1908	3.1841	3.1771
util living area	0.9826	0.9659	0.9294	0.8416	0.7050	0.5401	0.4091	0.4647	0.6988	0.9055	0.9705	0.9855 (86)
Living	19.2135	19.4681	19.8518	20.3188	20.6513	20.8261	20.8800	20.8679	20.7232	20.2401	19.6381	19.1708
Non living	17.9047	18.2282	18.7107	19.2854	19.6678	19.8529	19.8982	19.8918	19.7588	19.2062	18.4523	17.8546
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	20.0861	19.4681	19.8518	20.3188	20.6513	20.8261	20.8800	20.8679	20.7232	20.2401	19.6381	19.4267 (87)
Th 2	20.0160	20.0175	20.0191	20.0262	20.0275	20.0337	20.0337	20.0349	20.0313	20.0275	20.0248	20.0220 (88)
util rest of house	0.9795	0.9599	0.9171	0.8149	0.6584	0.4722	0.3254	0.3769	0.6343	0.8832	0.9643	0.9829 (89)
MIT 2	19.1743	18.2282	18.7107	19.2854	19.6678	19.8529	19.8982	19.8918	19.7588	19.2062	18.4523	18.2452 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	19.2648	18.3512	18.8240	19.3880	19.7654	19.9495	19.9956	19.9887	19.8545	19.3088	18.5700	18.3624 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2648	18.3512	18.8240	19.3880	19.7654	19.9495	19.9956	19.9887	19.8545	19.3088	18.5700	18.3624 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9766	0.9463	0.8981	0.7946	0.6446	0.4659	0.3219	0.3725	0.6212	0.8625	0.9516	0.9768 (94)
Useful gains	941.6574	1132.0730	1297.6550	1393.4456	1263.1251	917.4714	604.7787	631.8515	913.6994	1011.7566	928.6749	887.2597 (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	2772.2911	2487.5634	2275.2104	1920.6920	1474.8082	971.2707	616.5212	650.7121	1047.6771	1592.4428	2103.7906	2605.9380 (97)
Space heating kWh	1361.9915	910.8895	727.3013	379.6174	157.4923	0.0000	0.0000	0.0000	0.0000	432.0305	846.0833	1278.6966 (98a)
Space heating requirement - total per year (kWh/year)												6094.1024
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	1361.9915	910.8895	727.3013	379.6174	157.4923	0.0000	0.0000	0.0000	0.0000	432.0305	846.0833	1278.6966 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6094.1024
Space heating per m2										(98c) / (4) =		35.5756 (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 %)												281.6673 (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	1361.9915	910.8895	727.3013	379.6174	157.4923	0.0000	0.0000	0.0000	0.0000	432.0305	846.0833	1278.6966 (98)
Space heating efficiency (main heating system 1)	281.6673	281.6673	281.6673	281.6673	281.6673	0.0000	0.0000	0.0000	0.0000	281.6673	281.6673	281.6673 (210)
Space heating fuel (main heating system)	483.5462	323.3920	258.2129	134.7751	55.9143	0.0000	0.0000	0.0000	0.0000	153.3833	300.3839	453.9741 (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	280.5400	247.8240	262.5044	228.8562	220.5468	197.3107	193.6561	202.1101	205.1824	230.5068	247.2094	277.2133 (64)
Efficiency of water heater												177.3522 (216)
(217)m	177.3522	177.3522	177.3522	177.3522	177.3522	177.3522	177.3522	177.3522	177.3522	177.3522	177.3522	177.3522 (217)
Fuel for water heating, kWh/month	158.1824	139.7355	148.0130	129.0405	124.3552	111.2536	109.1929	113.9597	115.6920	129.9712	139.3890	156.3066 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	47.6471	38.2243	34.4167	25.2152	19.4769	15.9128	17.7675	23.0949	29.9979	39.3589	44.4558	48.9714 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												

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(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												2163.5818	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												177.3522	
Water heating fuel used												1575.0916	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												384.5393	(232)
Energy saving/generation technologies (Appendices M, N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												4123.2127	(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 (high-rate cost)	1730.8654	0.1634	282.8360	(261)
Space heating - main system 1 (low-rate cost)	432.7164	0.1372	59.3602	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating - high rate cost	1102.5641	0.1480	163.2035	(264)
Water heating - low rate cost	472.5275	0.1242	58.7028	(264)
Space and water heating			564.1025	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	384.5393	0.1490	57.3040	(268)
Total CO2, kg/year			621.4064	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.6300	(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 (high-rate cost)	1730.8654	1.2873	2785.1843	(275)
Space heating - main system 1 (low-rate cost)	432.7164	1.4966	647.5869	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating - high rate cost	1102.5641	1.5533	1712.6082	(278)
Water heating - low rate cost	472.5275	1.4446	682.6210	(278)
Space and water heating			5828.0005	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	384.5393	1.5547	597.8604	(282)
Total Primary energy kWh/year			6425.8609	(286)
Dwelling Primary energy Rate (DPER)			37.5100	(287)

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

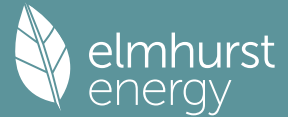
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	77.7000 (1b)	x 2.4000 (2b)	= 186.4800 (1b) - (3b)	
First floor	57.9000 (1c)	x 2.6000 (2c)	= 150.5400 (1c) - (3c)	
Second floor	35.7000 (1d)	x 2.4000 (2d)	= 85.6800 (1d) - (3d)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	171.3000			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 422.7000	(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) =	0.0946 (8)
Pressure test		Yes
Pressure Test Method		Blower Door

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Measured/design AP50 5.0000 (17)
Infiltration rate 0.3446 (18)
Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.2929 (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)
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	0.3735	0.3662	0.3588	0.3222	0.3149	0.2783	0.2783	0.2710	0.2929	0.3149	0.3296	0.3442 (22b)
	0.5697	0.5670	0.5644	0.5519	0.5496	0.5387	0.5387	0.5367	0.5429	0.5496	0.5543	0.5592 (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			1.9600	1.0000	1.9600		(26)
TER Semi-glazed door			1.9600	1.0000	1.9600		(26a)
TER Opening Type			22.1800	1.1450	25.3969		(27)
TER Roof Window			1.2200	1.1450	1.9419		(27a)
TER Roof Light			2.8000	1.5918	5.6618		(27a)
Heatloss Floor 1			77.7000	0.1300	10.1010		(28a)
Brick	166.2200	16.0300	150.1900	0.1800	27.0342		(29a)
Cladding	29.5200	10.0700	19.4500	0.1800	3.5010		(29a)
Ashlar wall	26.2500		26.2500	0.1800	4.7250		(29a)
Planed Roof	36.2000		36.2000	0.1100	3.9820		(30)
Sloped Roof	42.1800	1.2200	40.9600	0.1100	4.5056		(30)
Flat Roof	19.8000	2.8000	17.0000	0.1100	1.8700		(30)
Total net area of external elements Aum(A, m2)			397.8700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	92.6395		(33)

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

126.2839 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	34.4000	0.0900	3.0960
E17 Corner (inverted - internal area greater than external area)	3.0000	-0.0900	-0.2700
E13 Gable (insulation at rafter level)	13.6000	0.0800	1.0880
E10 Eaves (insulation at ceiling level)	13.9000	0.0600	0.8340
E2 Other lintels (including other steel lintels)	15.1200	0.0500	0.7560
E3 Sill	14.1900	0.0500	0.7095
E4 Jamb	26.7000	0.0500	1.3350
E5 Ground floor (normal)	37.0000	0.1600	5.9200
E6 Intermediate floor within a dwelling	30.9300	0.0000	0.0000
R1 Head of roof window	1.5600	0.0800	0.1248
R2 Sill of roof window	1.5600	0.0600	0.0936
R3 Jamb of roof window	3.1200	0.0800	0.2496
E12 Gable (insulation at ceiling level)	5.6000	0.0600	0.3360
R11 Upstands or kerbs of rooflights	8.6000	0.0800	0.6880

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

14.9605 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 107.6000 (37)

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

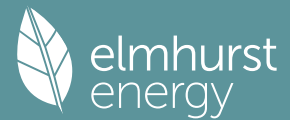
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	79.4748	79.0970	78.7266	76.9873	76.6618	75.1469	75.1469	74.8664	75.7304	76.6618	77.3202	78.0085 (38)
Average = Sum(39)m / 12 =	187.0747	186.6969	186.3266	184.5872	184.2618	182.7469	182.7469	182.4663	183.3304	184.2618	184.9201	185.6084 (39)
												184.5857

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0921	1.0899	1.0877	1.0776	1.0757	1.0668	1.0668	1.0652	1.0702	1.0757	1.0795	1.0835 (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													2.9643 (42)
Hot water usage for mixer showers	73.9216	72.8107	71.1919	68.0946	65.8089	63.2599	61.8111	63.4176	65.1787	67.9155	71.0793	73.6384 (42a)	
Hot water usage for baths	31.9119	31.4380	30.7706	29.5400	28.6186	27.5969	27.0450	27.7077	28.4293	29.5226	30.7785	31.8040 (42b)	
Hot water usage for other uses	44.9875	43.3516	41.7157	40.0798	38.4439	36.8080	36.8080	38.4439	40.0798	41.7157	43.3516	44.9875 (42c)	
Average daily hot water use (litres/day)												138.6384 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	150.8210	147.6003	143.6782	137.7144	132.8714	127.6647	125.6640	129.5692	133.6878	139.1538	145.2094	150.4299 (44)	
Energy conte	238.8636	210.1808	220.8280	188.5242	178.8704	156.9787	151.9797	160.4337	164.8504	188.8304	206.8774	235.5369 (45)	
Energy content (annual)										Total =	Sum(45)m =	2302.7542	
Distribution loss (46)m = 0.15 x (45)m	35.8295	31.5271	33.1242	28.2786	26.8306	23.5468	22.7970	24.0651	24.7276	28.3246	31.0316	35.3305 (46)	
Water storage loss:													
Store volume												250.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.8903 (48)	
Temperature factor from Table 2b												0.5400 (49)	
Enter (49) or (54) in (55)												1.0208 (55)	
Total storage loss	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444 (56)	
If cylinder contains dedicated solar storage	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444 (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	293.7704	259.7741	275.7348	241.6598	233.7772	210.1143	206.8865	215.3405	217.9860	243.7372	260.0130	290.4437 (62)	
WWHRS	-33.7939	-29.8876	-31.2965	-25.9148	-24.1516	-20.6667	-19.3718	-20.5999	-21.3826	-25.2077	-28.5573	-33.1681 (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	259.9766	229.8865	244.4383	215.7450	209.6255	189.4476	187.5147	194.7406	196.6034	218.5295	231.4558	257.2756 (64)	

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12Total per year (kWh/year)											Total per year (kWh/year) = Sum(64)m = 2635.2389 (64)	
Electric shower(s)											2635 (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												
123.3476	109.5597	117.3507	105.1928	103.3998	94.7039	94.4587	97.2696	97.3212	106.7115	111.2952	122.2415 (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	148.2155	148.2155	148.2155	148.2155	148.2155	148.2155	148.2155	148.2155	148.2155	148.2155	148.2155	148.2155	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	180.9328	200.3185	180.9328	186.9639	180.9328	186.9639	180.9328	180.9328	186.9639	180.9328	186.9639	180.9328	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	342.8732	346.4311	337.4652	318.3778	294.2834	271.6381	256.5096	252.9517	261.9176	281.0050	305.0994	327.7447	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.8216	37.8216	37.8216	37.8216	37.8216	37.8216	37.8216	37.8216	37.8216	37.8216	37.8216	37.8216	(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)	-118.5724	-118.5724	-118.5724	-118.5724	-118.5724	-118.5724	-118.5724	-118.5724	-118.5724	-118.5724	-118.5724	-118.5724	(71)
Water heating gains (Table 5)	165.7898	163.0353	157.7295	146.1011	138.9783	131.5332	126.9606	130.7388	135.1684	143.4295	154.5767	164.3030	(72)
Total internal gains	760.0605	780.2496	746.5922	721.9075	684.6592	657.5999	631.8677	632.0879	651.5146	675.8320	717.1047	743.4452	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
East	6.6200	19.6403	0.6300	0.7000	0.7700	39.7354 (76)
South	0.8300	46.7521	0.6300	0.7000	0.7700	11.8591 (78)
West	14.7300	19.6403	0.6300	0.7000	0.7700	88.4142 (80)
North	1.2200	26.0000	0.6300	0.7000	1.0000	12.5897 (82)
Horizontal	2.8000	26.0000	0.6300	0.7000	1.0000	28.8943 (82)

Solar gains	181.4926	356.2688	590.7588	869.4052	1073.3929	1102.5328	1048.1110	894.8514	689.4891	423.7161	226.4972	149.1376	(83)
Total gains	941.5531	1136.5184	1337.3511	1591.3127	1758.0521	1760.1327	1679.9787	1526.9393	1341.0036	1099.5481	943.6019	892.5828	(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	32.1209	32.1859	32.2499	32.5538	32.6113	32.8816	32.8816	32.9322	32.7769	32.6113	32.4952	32.3747
alpha	3.1414	3.1457	3.1500	3.1703	3.1741	3.1921	3.1921	3.1955	3.1851	3.1741	3.1663	3.1583
util living area	0.9837	0.9703	0.9417	0.8703	0.7506	0.5907	0.4537	0.5099	0.7384	0.9189	0.9731	0.9862 (86)
MIT	18.7009	19.0080	19.4893	20.1084	20.5858	20.8631	20.9559	20.9359	20.7106	20.0476	19.2651	18.6529 (87)
Th 2	20.0073	20.0091	20.0109	20.0192	20.0208	20.0280	20.0280	20.0294	20.0252	20.0208	20.0176	20.0143 (88)
util rest of house	0.9808	0.9650	0.9311	0.8467	0.7061	0.5202	0.3627	0.4162	0.6758	0.8989	0.9674	0.9837 (89)
MIT 2	17.3027	17.6934	18.3009	19.0685	19.6270	19.9248	20.0049	19.9931	19.7819	19.0124	18.0289	17.2457 (90)
Living area fraction	17.4414	17.8238	18.4189	19.1717	19.7222	20.0179	20.0992	20.0867	19.8741	19.1151	18.1516	17.3854 (91)
MIT	17.4414	17.8238	18.4189	19.1717	19.7222	20.0179	20.0992	20.0867	19.8741	19.1151	18.1516	17.3854 (92)
Temperature adjustment												0.0000
adjusted MIT	17.4414	17.8238	18.4189	19.1717	19.7222	20.0179	20.0992	20.0867	19.8741	19.1151	18.1516	17.3854 (93)

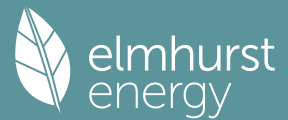
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9692	0.9482	0.9083	0.8221	0.6909	0.5194	0.3697	0.4220	0.6648	0.8748	0.9515	0.9733	(94)
Useful gains	912.5129	1077.6205	1214.7398	1308.2245	1214.6934	914.2786	621.0084	644.3706	891.5134	961.9131	897.8067	868.7736	(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	2458.4314	2412.8370	2220.7999	1896.0248	1478.1827	990.1097	639.4746	672.6937	1058.5705	1569.0160	2043.6630	2447.3141	(97)
Space heating kWh	1150.1633	897.2655	748.5087	423.2162	196.0361	0.0000	0.0000	0.0000	0.0000	451.6846	825.0166	1174.4341	(98a)
Space heating requirement - total per year (kWh/year)												5866.3250	
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	1150.1633	897.2655	748.5087	423.2162	196.0361	0.0000	0.0000	0.0000	0.0000	451.6846	825.0166	1174.4341	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5866.3250	
Space heating per m2												(98c) / (4) =	34.2459 (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	1150.1633	897.2655	748.5087	423.2162	196.0361	0.0000	0.0000	0.0000	0.0000	451.6846	825.0166	1174.4341	(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)

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Space heating fuel (main heating system)	1246.1141	972.1186	810.9520	458.5224	212.3901	0.0000	0.0000	0.0000	0.0000	489.3658	893.8424	1272.4097	(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	259.9766	229.8865	244.4383	215.7450	209.6255	189.4476	187.5147	194.7406	196.6034	218.5295	231.4558	257.2756	(64)
Efficiency of water heater	86.9912	86.8033	86.4012	85.5425	83.9097	79.8000	79.8000	79.8000	79.8000	85.6503	86.6588	79.8000	(216)
Fuel for water heating, kWh/month	298.8538	264.8360	282.9109	252.2080	249.8227	237.4029	234.9809	244.0358	246.3701	255.1414	267.0887	295.5966	(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	7.0685	7.3041	7.0685	7.3041	7.0685	(231)
Lighting	37.5943	30.1595	27.1553	19.8951	15.3676	12.5554	14.0188	18.2222	23.6688	31.0548	35.0763	38.6391	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-68.1818	-93.8930	-131.8073	-144.5264	-152.6829	-141.2298	-139.3096	-132.9442	-121.4114	-105.4449	-74.0895	-59.1971	(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)	-45.5863	-94.9992	-187.2593	-279.0963	-367.0792	-368.2749	-364.1000	-309.3072	-227.9733	-135.3223	-60.6699	-36.1315	(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												6355.7151	(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												3129.2478	(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)												303.4073	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3840.5172	(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												6033.8530	(238)

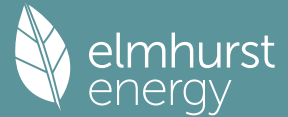
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	6355.7151	0.2100	1334.7002 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3129.2478	0.2100	657.1420 (264)
Space and water heating			1991.8422 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	303.4073	0.1443	43.7910 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1364.7179	0.1351	-184.4145
PV Unit electricity exported	-2475.7993	0.1261	-312.2326
Total			-496.6471 (269)
Total CO2, kg/year			1550.9154 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.0500 (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	6355.7151	1.1300	7181.9581 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3129.2478	1.1300	3536.0500 (278)
Space and water heating			10718.0081 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	303.4073	1.5338	465.3762 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1364.7179	1.4994	-2046.3242
PV Unit electricity exported	-2475.7993	0.4629	-1146.1307
Total			-3192.4549 (283)
Total Primary energy kWh/year			8121.0302 (286)
Target Primary Energy Rate (TPER)			47.4100 (287)

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Property Reference	P19 Ladds			Issued on Date	21/08/2025
Assessment Reference	Detached	Prop Type Ref	Semi		
Property	1, Bath Road, Hare Hatch, Berkshire, RG10 9SA				
SAP Rating	82 B	DER	3.56	TER	8.49
Environmental	96 A	% DER < TER			58.07
CO ₂ Emissions (t/year)	0.51	DFEE	34.95	TFEE	38.43
Compliance Check	See BREL	% DFEE < TFEE			9.07
% DPER < TPER	17.08	DPER	36.93	TPER	44.53
Assessor Details	Mrs. Rebecca Lennon			Assessor ID	P627-0001
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	86.5000 (1b)	x 2.4000 (2b)	= 207.6000 (1b) - (3b)
First floor	74.5000 (1c)	x 2.6000 (2c)	= 193.7000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	161.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 401.3000 (5)

2. Ventilation rate

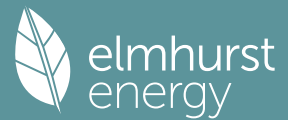
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	1 * 20 = 20.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	5 * 10 = 50.0000 (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) =	70.0000 / (5) = 0.1744 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3744 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3183 (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	0.4058	0.3978	0.3899	0.3501	0.3421	0.3024	0.3024	0.2944	0.3183	0.3421	0.3581	0.3740 (22b)
Effective ac	0.5823	0.5791	0.5760	0.5613	0.5585	0.5457	0.5457	0.5433	0.5506	0.5585	0.5641	0.5699 (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							
Ent Door			1.9600	1.2000	2.3520		(26a)
Windows			28.4300	1.1450	32.5534		(27)
Side Door			1.9600	1.2000	2.3520		(26a)
Heatloss Floor 1			86.5000	0.1200	10.3800	75.0000	6487.5000 (28a)
Brick	165.9500	29.9000	136.0500	0.2000	27.2100	60.0000	8163.0000 (29a)
Cladding	23.2100	2.4500	20.7600	0.1900	3.9444	60.0000	1245.6000 (29a)
Planned Roof	86.5000		86.5000	0.0900	7.7850	9.0000	778.5000 (30)
Total net area of external elements Aum(A, m ²)			362.1600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		86.5768		(33)
Main dwelling							
Internal Wall 1			296.6100			9.0000	2669.4900 (32c)
Internal Floor 1			74.5400			18.0000	1341.7200 (32d)
Internal Ceiling 1			74.5400			9.0000	670.8600 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	21356.6700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							132.6501 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E17 Corner (inverted - internal area greater than external area)				2.4000	-0.0510	-0.1224	

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E12 Gable (insulation at ceiling level)						14.7400	0.0730	1.0760				
E10 Eaves (insulation at ceiling level)						29.9000	0.0840	2.5116				
E2 Other lintels (including other steel lintels)						20.3000	0.0480	0.9744				
E3 Sill						18.4400	0.0450	0.8298				
E4 Jamb						45.0000	0.0510	2.2950				
E5 Ground floor (normal)						40.9000	0.0640	2.6176				
E6 Intermediate floor within a dwelling						35.0000	0.0000	0.0000				
E16 Corner (normal)						27.2000	0.0570	1.5504				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												11.7324 (36)
Point Thermal bridges												0.0000
Total fabric heat loss												(33) + (36) + (36a) = 98.3093 (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	77.1178	76.6945	76.2794	74.3302	73.9655	72.2677	72.2677	71.9533	72.9217	73.9655	74.7033	75.4746 (38)
Average = Sum(39)m / 12 =	175.4271	175.0037	174.5887	172.6394	172.2747	170.5770	170.5770	170.2626	171.2309	172.2747	173.0125	173.7838 (39)
												172.6377
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0896	1.0870	1.0844	1.0723	1.0700	1.0595	1.0595	1.0575	1.0635	1.0700	1.0746	1.0794 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31
												1.0723

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.9503 (42)
Hot water usage for mixer showers												
	73.6868	72.5794	70.9658	67.8783	65.5999	63.0590	61.6147	63.2162	64.9716	67.6998	70.8535	73.4045 (42a)
Hot water usage for baths												
	31.8109	31.3385	30.6732	29.4465	28.5280	27.5095	26.9594	27.6200	28.3393	29.4292	30.6811	31.7034 (42b)
Hot water usage for other uses												
	44.8441	43.2134	41.5827	39.9520	38.3213	36.6906	36.6906	38.3213	39.9520	41.5827	43.2134	44.8441 (42c)
Average daily hot water use (litres/day)												138.1978 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	150.3418	147.1313	143.2217	137.2769	132.4492	127.2591	125.2647	129.1575	133.2630	138.7116	144.7480	149.9519 (44)
Energy content (annual)	238.1047	209.5130	220.1264	187.9252	178.3021	156.4799	151.4968	159.9239	164.3266	188.2304	206.2201	234.7885 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 2295.4375
	35.7157	31.4270	33.0190	28.1888	26.7453	23.4720	22.7245	23.9886	24.6490	28.2346	30.9330	35.2183 (46)
Water storage loss:												
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.1000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.5940 (55)
Total storage loss												
	18.4140	16.6320	18.4140	17.8200	18.4140	17.8200	18.4140	18.4140	17.8200	18.4140	17.8200	18.4140 (56)
If cylinder contains dedicated solar storage												
	18.4140	16.6320	18.4140	17.8200	18.4140	17.8200	18.4140	18.4140	17.8200	18.4140	17.8200	18.4140 (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												
	279.7811	247.1562	261.8028	228.2572	219.9785	196.8119	193.1732	201.6003	204.6586	229.9068	246.5521	276.4649 (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	279.7811	247.1562	261.8028	228.2572	219.9785	196.8119	193.1732	201.6003	204.6586	229.9068	246.5521	276.4649 (64)
12Total per year (kWh/year)												2786.1435 (64)
Electric shower(s)												2786 (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												
	112.5109	99.7776	106.5331	94.7507	92.6266	84.2952	83.7138	86.5158	86.9042	95.9277	100.8338	111.4083 (65)

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

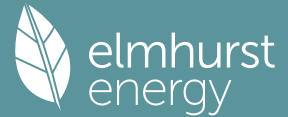
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	147.5153	147.5153	147.5153	147.5153	147.5153	147.5153	147.5153	147.5153	147.5153	147.5153	147.5153	147.5153 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	171.6994	190.0958	171.6994	177.4228	171.6994	177.4228	171.6994	171.6994	177.4228	171.6994	177.4228	171.6994 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	332.2527	335.7004	327.0122	308.5161	285.1680	263.2241	248.5642	245.1165	253.8047	272.3009	295.6489	317.5928 (68)
Pumps, fans	37.7515	37.7515	37.7515	37.7515	37.7515	37.7515	37.7515	37.7515	37.7515	37.7515	37.7515	37.7515 (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)
Water heating gains (Table 5)	-118.0122	-118.0122	-118.0122	-118.0122	-118.0122	-118.0122	-118.0122	-118.0122	-118.0122	-118.0122	-118.0122	-118.0122 (71)
Total internal gains	151.2244	148.4786	143.1897	131.5982	124.4981	117.0766	112.5186	116.2847	120.7003	128.9351	140.0469	149.7423 (72)
	722.4311	741.5295	709.1560	684.7916	648.6201	624.9781	600.0368	600.3552	619.1823	640.1900	680.3732	706.2892 (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			11.3700	10.6334	0.5100	0.0000	0.7700	47.4781 (74)				
East			1.6200	19.6403	0.5100	0.0000	0.7700	12.4946 (76)				
South			15.4400	46.7521	0.5100	0.0000	0.7700	283.4712 (78)				

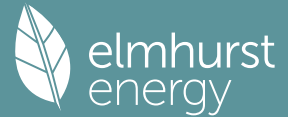
Solar gains	343.4439	579.4280	785.8061	974.7380	1102.0487	1101.0679	1058.4562	960.7709	849.9489	637.7487	410.1597	294.8003 (83)
Total gains	1065.8750	1320.9575	1494.9621	1659.5296	1750.6688	1726.0460	1658.4930	1561.1262	1469.1312	1277.9387	1090.5329	1001.0895 (84)

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7. Mean internal temperature (heating season)												
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	33.8169	33.8988	33.9793	34.3630	34.4357	34.7785	34.7785	34.8427	34.6457	34.4357	34.2889	34.1367
alpha	3.2545	3.2599	3.2653	3.2909	3.2957	3.3186	3.3186	3.3228	3.3097	3.2957	3.2859	3.2758
util living area	0.9760	0.9532	0.9180	0.8464	0.7321	0.5735	0.4341	0.4751	0.6785	0.8770	0.9579	0.9801 (86)
Living	19.3786	19.6452	19.9676	20.3506	20.6462	20.8243	20.8823	20.8735	20.7566	20.3614	19.8023	19.3349
Non living	18.1042	18.4415	18.8454	19.3195	19.6620	19.8539	19.9024	19.8984	19.7902	19.3443	18.6511	18.0548
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	20.1706	19.6452	19.9676	20.3506	20.6462	20.8243	20.8823	20.8735	20.7566	20.3614	19.8023	19.5678 (87)
Th 2	20.0093	20.0115	20.0136	20.0235	20.0254	20.0341	20.0341	20.0357	20.0307	20.0254	20.0216	20.0177 (88)
util rest of house	0.9716	0.9451	0.9037	0.8195	0.6858	0.5031	0.3459	0.3852	0.6123	0.8495	0.9492	0.9764 (89)
MIT 2	19.2498	18.4415	18.8454	19.3195	19.6620	19.8539	19.9024	19.8984	19.7902	19.3443	18.6511	18.4085 (90)
Living area fraction	19.3549	18.5788	18.9735	19.4371	19.7743	19.9646	20.0142	20.0097	19.9005	19.4603	18.7825	18.5408 (91)
MIT	19.3549	18.5788	18.9735	19.4371	19.7743	19.9646	20.0142	20.0097	19.9005	19.4603	18.7825	18.5408 (92)
Temperature adjustment	19.3549	18.5788	18.9735	19.4371	19.7743	19.9646	20.0142	20.0097	19.9005	19.4603	18.7825	0.0000
adjusted MIT	19.3549	18.5788	18.9735	19.4371	19.7743	19.9646	20.0142	20.0097	19.9005	19.4603	18.7825	18.5408 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9682	0.9299	0.8851	0.8008	0.6727	0.4977	0.3440	0.3827	0.6025	0.8302	0.9347	0.9692 (94)
Useful gains	1031.9889	1228.3676	1323.2174	1329.0305	1177.6188	859.1237	570.5330	597.4590	885.1579	1060.9658	1019.3644	970.2777 (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	2641.0351	2393.8431	2177.7254	1819.1275	1390.9909	915.0736	582.3855	614.5913	993.2217	1526.4084	2021.2132	2492.1926 (97)
Space heating kWh	1197.1303	783.1995	635.7539	352.8699	158.7489	0.0000	0.0000	0.0000	0.0000	346.2893	721.3311	1132.3047 (98a)
Space heating requirement - total per year (kWh/year)												5327.6277
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	1197.1303	783.1995	635.7539	352.8699	158.7489	0.0000	0.0000	0.0000	0.0000	346.2893	721.3311	1132.3047 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5327.6277
Space heating per m2										(98c) / (4) =		33.0909 (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 %)												283.3667 (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	1197.1303	783.1995	635.7539	352.8699	158.7489	0.0000	0.0000	0.0000	0.0000	346.2893	721.3311	1132.3047 (98)
Space heating efficiency (main heating system 1)	283.3667	283.3667	283.3667	283.3667	283.3667	0.0000	0.0000	0.0000	0.0000	283.3667	283.3667	283.3667 (210)
Space heating fuel (main heating system)	422.4668	276.3908	224.3573	124.5276	56.0224	0.0000	0.0000	0.0000	0.0000	122.2054	254.5575	399.5899 (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	279.7811	247.1562	261.8028	228.2572	219.9785	196.8119	193.1732	201.6003	204.6586	229.9068	246.5521	276.4649 (64)
Efficiency of water heater (217)m	177.3117	177.3117	177.3117	177.3117	177.3117	177.3117	177.3117	177.3117	177.3117	177.3117	177.3117	177.3117 (216)
Fuel for water heating, kWh/month	157.7905	139.3908	147.6512	128.7322	124.0632	110.9977	108.9456	113.6983	115.4231	129.6625	139.0501	155.9203 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	45.6245	36.6017	32.9558	24.1448	18.6501	15.2373	17.0133	22.1145	28.7246	37.6882	42.5687	46.8926 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1880.1176 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												177.3117
Water heating fuel used												1571.3254 (219)
Space cooling fuel												0.0000 (221)

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Electricity for pumps and fans:
 Total electricity for the above, kWh/year 0.0000 (231)
 Electricity for lighting (calculated in Appendix L) 368.2160 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
 PV generation 0.0000 (233)
 Wind generation 0.0000 (234)
 Hydro-electric generation (Appendix N) 0.0000 (235a)
 Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
 Appendix Q - special features
 Energy saved or generated -0.0000 (236)
 Energy used 0.0000 (237)
 Total delivered energy for all uses 3819.6591 (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 (high-rate cost)	1504.0941	0.1634	245.7860 (261)
Space heating - main system 1 (low-rate cost)	376.0235	0.1372	51.5846 (261)
Total CO2 associated with community systems			0.0000 (261)
Water heating - high rate cost	1099.9278	0.1480	162.8117 (264)
Water heating - low rate cost	471.3976	0.1242	58.5618 (264)
Space and water heating			518.7442 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	368.2160	0.1490	54.8715 (268)
Total CO2, kg/year			573.6156 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.5600 (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 (high-rate cost)	1504.0941	1.2873	2420.3082 (275)
Space heating - main system 1 (low-rate cost)	376.0235	1.4966	562.7470 (275)
Total CO2 associated with community systems			0.0000 (275)
Water heating - high rate cost	1099.9278	1.5533	1708.5077 (278)
Water heating - low rate cost	471.3976	1.4446	680.9866 (278)
Space and water heating			5372.5495 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	368.2160	1.5547	572.4819 (282)
Total Primary energy kWh/year			5945.0313 (286)
Dwelling Primary energy Rate (DPER)			36.9300 (287)

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

1. Overall dwelling characteristics

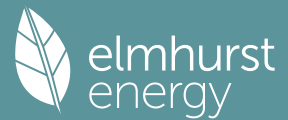
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	86.5000 (1b)	x 2.4000 (2b)	= 207.6000 (1b) - (3b)
First floor	74.5000 (1c)	x 2.6000 (2c)	= 193.7000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	161.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 401.3000 (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) = 0.0997 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3497 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2972 (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	0.3790	0.3715	0.3641	0.3269	0.3195	0.2824	0.2824	0.2749	0.2972	0.3195	0.3344	0.3492 (22b)
Effective ac	0.5718	0.5690	0.5663	0.5534	0.5510	0.5399	0.5399	0.5378	0.5442	0.5510	0.5559	0.5610 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Semi-glazed door			3.9200	1.0000	3.9200			(26a)
TER Opening Type			28.4300	1.1450	32.5534			(27)
Heatloss Floor 1			86.5000	0.1300	11.2450			(28a)
Brick	165.9500	29.9000	136.0500	0.1800	24.4890			(29a)
Cladding	23.2100	2.4500	20.7600	0.1800	3.7368			(29a)
Planned Roof	86.5000		86.5000	0.1100	9.5150			(30)
Total net area of external elements Aum(A, m2)			362.1600					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	85.4592		(33)

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

132.6501 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E17 Corner (inverted - internal area greater than external area)	2.4000	-0.0900	-0.2160	
E12 Gable (insulation at ceiling level)	14.7400	0.0600	0.8844	
E10 Eaves (insulation at ceiling level)	29.9000	0.0600	1.7940	
E2 Other lintels (including other steel lintels)	20.3000	0.0500	1.0150	
E3 Sill	18.4400	0.0500	0.9220	
E4 Jamb	45.0000	0.0500	2.2500	
E5 Ground floor (normal)	40.9000	0.1600	6.5440	
E6 Intermediate floor within a dwelling	35.0000	0.0000	0.0000	
E16 Corner (normal)	27.2000	0.0900	2.4480	

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

15.6414 (36)

Point Thermal Bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 101.1006 (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	75.7237	75.3544	74.9925	73.2925	72.9744	71.4937	71.4937	71.2195	72.0641	72.9744	73.6178	74.2905	(38)
Average = Sum(39)m / 12 =	176.8243	176.4551	176.0931	174.3931	174.0750	172.5944	172.5944	172.3202	173.1647	174.0750	174.7185	175.3912	(39)
												174.3916	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0983	1.0960	1.0937	1.0832	1.0812	1.0720	1.0720	1.0703	1.0756	1.0812	1.0852	1.0894	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	

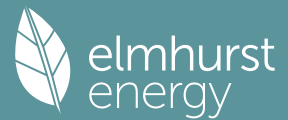
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9503 (42)
Hot water usage for mixer showers	73.6868	72.5794	70.9658	67.8783	65.5999	63.0590	61.6147	63.2162	64.9716	67.6998	70.8535	73.4045	(42a)
Hot water usage for baths	31.8109	31.3385	30.6732	29.4465	28.5280	27.5095	26.9594	27.6200	28.3393	29.4292	30.6811	31.7034	(42b)
Hot water usage for other uses	44.8441	43.2134	41.5827	39.9520	38.3213	36.6906	36.6906	38.3213	39.9520	41.5827	43.2134	44.8441	(42c)
Average daily hot water use (litres/day)													138.1978 (43)
Daily hot water use	150.3418	147.1313	143.2217	137.2769	132.4492	127.2591	125.2647	129.1575	133.2630	138.7116	144.7480	149.9519	(44)
Energy content (annual)	238.1047	209.5130	220.1264	187.9252	178.3021	156.4799	151.4968	159.9239	164.3266	188.2304	206.2201	234.7885	(45)
Distribution loss (46)m = 0.15 x (45)m	35.7157	31.4270	33.0190	28.1888	26.7453	23.4720	22.7245	23.9886	24.6490	28.2346	30.9330	35.2183	(46)
Water storage loss:													
Store volume													250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.8903 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.0208 (55)
Total storage loss	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(56)
If cylinder contains dedicated solar storage	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(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	293.0115	259.1062	275.0332	241.0608	233.2089	209.6155	206.4036	214.8307	217.4622	243.1372	259.3557	289.6953	(62)
WWHRS	-33.6865	-29.7926	-31.1971	-25.8325	-24.0749	-20.6011	-19.3102	-20.5345	-21.3147	-25.1276	-28.4666	-33.0627	(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	(64a)
Output from w/h	259.3249	229.3136	243.8360	215.2283	209.1339	189.0144	187.0934	194.2962	196.1475	218.0095	230.8891	256.6326	(64)
Total per year (kWh/year)													2628.9196 (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	123.0952	109.3377	117.1174	104.9936	103.2109	94.5381	94.2981	97.1001	97.1471	106.5120	111.0767	121.9926	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	147.5153	147.5153	147.5153	147.5153	147.5153	147.5153	147.5153	147.5153	147.5153	147.5153	147.5153	147.5153	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	171.6994	190.0958	171.6994	177.4228	171.6994	177.4228	171.6994	171.6994	177.4228	171.6994	177.4228	171.6994	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	332.2527	335.7004	327.0122	308.5161	285.1680	263.2241	248.5642	245.1165	253.8047	272.3009	295.6489	317.5928	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7515	37.7515	37.7515	37.7515	37.7515	37.7515	37.7515	37.7515	37.7515	37.7515	37.7515	37.7515	(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)	-118.0122	-118.0122	-118.0122	-118.0122	-118.0122	-118.0122	-118.0122	-118.0122	-118.0122	-118.0122	-118.0122	-118.0122	(71)
Water heating gains (Table 5)	165.4506	162.7049	157.4159	145.8244	138.7243	131.3029	126.7448	130.5109	134.9265	143.1613	154.2731	163.9686	(72)

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Total internal gains
739.6573 758.7557 726.3822 702.0179 665.8463 639.2043 614.2631 614.5815 633.4085 657.4162 697.5994 723.5154 (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					11.3700	10.6334	0.6300	0.7000	0.7700			36.9491 (74)
East					1.6200	19.6403	0.6300	0.7000	0.7700			9.7238 (76)
South					15.4400	46.7521	0.6300	0.7000	0.7700			220.6073 (78)
Solar gains	267.2802	450.9313	611.5420	758.5755	857.6532	856.8899	823.7280	747.7058	661.4602	496.3186	319.2008	229.4240 (83)
Total gains	1006.9375	1209.6870	1337.9242	1460.5934	1523.4995	1496.0942	1437.9910	1362.2873	1294.8687	1153.7348	1016.8002	952.9394 (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	33.5497	33.6199	33.6890	34.0174	34.0796	34.3720	34.3720	34.4267	34.2588	34.0796	33.9541	33.8239	
alpha	3.2366	3.2413	3.2459	3.2678	3.2720	3.2915	3.2915	3.2951	3.2839	3.2720	3.2636	3.2549	
util living area	0.9795	0.9629	0.9376	0.8832	0.7886	0.6406	0.4955	0.5366	0.7349	0.9028	0.9652	0.9827 (86)	
MIT	18.8863	19.1974	19.6021	20.1146	20.5491	20.8416	20.9493	20.9332	20.7368	20.1695	19.4387	18.8339 (87)	
Th 2	20.0022	20.0041	20.0059	20.0146	20.0162	20.0238	20.0238	20.0252	20.0208	20.0162	20.0129	20.0095 (88)	
util rest of house	0.9758	0.9563	0.9260	0.8606	0.7460	0.5679	0.3977	0.4388	0.6706	0.8792	0.9578	0.9795 (89)	
MIT 2	17.5281	17.9224	18.4324	19.0707	19.5850	19.9036	19.9973	19.9878	19.8030	19.1502	18.2378	17.4660 (90)	
Living area fraction									fLA = Living area / (4) =				0.1141 (91)
MIT	17.6830	18.0679	18.5659	19.1898	19.6950	20.0107	20.1059	20.0957	19.9096	19.2665	18.3748	17.6221 (92)	
Temperature adjustment												0.0000	
adjusted MIT	17.6830	18.0679	18.5659	19.1898	19.6950	20.0107	20.1059	20.0957	19.9096	19.2665	18.3748	17.6221 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9628	0.9383	0.9040	0.8376	0.7302	0.5669	0.4063	0.4464	0.6624	0.8566	0.9406	0.9680 (94)
Useful gains	969.5286	1135.1011	1209.5007	1223.3880	1112.4078	848.1098	584.2990	608.0593	857.7731	988.2615	956.3656	922.4129 (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	2366.4478	2323.5399	2124.7163	1794.4721	1391.7246	933.8485	605.0961	636.8393	1006.0122	1508.6234	1969.9172	2354.1173 (97)
Space heating kWh	1039.3079	798.6309	680.9204	411.1806	207.8117	0.0000	0.0000	0.0000	0.0000	387.1493	729.7572	1065.1881 (98a)
Space heating requirement - total per year (kWh/year)												5319.9461
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	1039.3079	798.6309	680.9204	411.1806	207.8117	0.0000	0.0000	0.0000	0.0000	387.1493	729.7572	1065.1881 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5319.9461
Space heating per m2										(98c) / (4) =		33.0431 (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	1039.3079	798.6309	680.9204	411.1806	207.8117	0.0000	0.0000	0.0000	0.0000	387.1493	729.7572	1065.1881 (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)	1126.0107	865.2556	737.7253	445.4828	225.1482	0.0000	0.0000	0.0000	0.0000	419.4467	790.6361	1154.0499 (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	259.3249	229.3136	243.8360	215.2283	209.1339	189.0144	187.0934	194.2962	196.1475	218.0095	230.8891	256.6326 (64)
Efficiency of water heater												79.8000 (216)
(217)m	86.8441	86.6207	86.2355	85.4873	84.0456	79.8000	79.8000	79.8000	79.8000	85.3329	86.4564	86.8972 (217)
Fuel for water heating, kWh/month	298.6096	264.7331	282.7558	251.7664	248.8340	236.8602	234.4528	243.4790	245.7989	255.4811	267.0584	295.3288 (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	35.6758	28.6204	25.7695	18.8798	14.5833	11.9147	13.3034	17.2923	22.4610	29.4700	33.2863	36.6673 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-73.1024	-99.3030	-137.5435	-148.7527	-155.4803	-143.2365	-141.2730	-135.6064	-125.1241	-110.4986	-78.9368	-63.6343 (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)												

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(233b)m	-53.5507	-110.9824	-217.6593	-322.8478	-423.1480	-423.9727	-419.1509	-356.7326	-263.8305	-157.5369	-71.0850	-42.4908	(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												5763.7552	(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												3125.1582	(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)												287.9238	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-4275.4792	(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												4987.3580	(238)

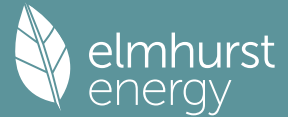
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	5763.7552	0.2100	1210.3886	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3125.1582	0.2100	656.2832	(264)
Space and water heating			1866.6718	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	287.9238	0.1443	41.5563	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1412.4916	0.1354	-191.2858	
PV Unit electricity exported	-2862.9876	0.1263	-361.4794	
Total			-552.7652	(269)
Total CO2, kg/year			1367.3922	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.4900	(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	5763.7552	1.1300	6513.0434	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3125.1582	1.1300	3531.4288	(278)
Space and water heating			10044.4722	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	287.9238	1.5338	441.6271	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1412.4916	1.5006	-2119.5170	
PV Unit electricity exported	-2862.9876	0.4635	-1326.9226	
Total			-3446.4397	(283)
Total Primary energy kWh/year			7169.7604	(286)
Target Primary Energy Rate (TPER)			44.5300	(287)

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Property Reference	P19 Ladds			Issued on Date	21/08/2025
Assessment Reference	Detached	Prop Type Ref	Semi		
Property	1, Bath Road, Hare Hatch, Berkshire, RG10 9SA				
SAP Rating	82 B	DER	3.56	TER	8.49
Environmental	96 A	% DER < TER			58.07
CO ₂ Emissions (t/year)	0.51	DFEE	34.95	TFEE	38.43
Compliance Check	See BREL	% DFEE < TFEE			9.07
% DPER < TPER	17.08	DPER	36.93	TPER	44.53
Assessor Details	Mrs. Rebecca Lennon			Assessor ID	P627-0001
Client					

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	86.5000 (1b)	x 2.4000 (2b)	= 207.6000 (1b) - (3b)
First floor	74.5000 (1c)	x 2.6000 (2c)	= 193.7000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	161.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 401.3000 (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	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) =	Air changes per hour 40.0000 / (5) = 0.0997 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.2997 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2547 (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	0.3248	0.3184	0.3120	0.2802	0.2738	0.2420	0.2420	0.2356	0.2547	0.2738	0.2866	0.2993 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5527	0.5507	0.5487	0.5393	0.5375	0.5293	0.5293	0.5278	0.5324	0.5375	0.5411	0.5448 (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							
Ent Door			1.9600	1.2000	2.3520		(26a)
Windows			28.4300	1.1450	32.5534		(27)
Side Door			1.9600	1.2000	2.3520		(26a)
Heatloss Floor 1			86.5000	0.1200	10.3800	75.0000	6487.5000 (28a)
Brick	165.9500	29.9000	136.0500	0.2000	27.2100	60.0000	8163.0000 (29a)
Cladding		2.4500	20.7600	0.1900	3.9444	60.0000	1245.6000 (29a)
Planned Roof	86.5000		86.5000	0.0900	7.7850	9.0000	778.5000 (30)
Total net area of external elements Aum(A, m ²)			362.1600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	86.5768		(33)
Main dwelling							
Internal Wall 1			296.6100			9.0000	2669.4900 (32c)
Internal Floor 1			74.5400			18.0000	1341.7200 (32d)
Internal Ceiling 1			74.5400			9.0000	670.8600 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	21356.6700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							132.6501 (35)
List of Thermal Bridges							

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	34.5897	34.6445	34.6984	34.9536	35.0018	35.2278	35.2278	35.2700	35.1404	35.0018	34.9045	34.8033
alpha	3.3060	3.3096	3.3132	3.3302	3.3335	3.3485	3.3485	3.3513	3.3427	3.3335	3.3270	3.3202
util living area	0.9814	0.9608	0.9280	0.8590	0.7464	0.5884	0.4469	0.4907	0.6970	0.8916	0.9661	0.9849 (86)
MIT	18.9238	19.2851	19.7210	20.2370	20.6413	20.8839	20.9650	20.9518	20.7879	20.2413	19.4813	18.8558 (87)
Th 2	20.0293	20.0307	20.0320	20.0384	20.0396	20.0452	20.0452	20.0462	20.0431	20.0396	20.0372	20.0347 (88)
util rest of house	0.9780	0.9539	0.9152	0.8337	0.7013	0.5181	0.3576	0.3997	0.6319	0.8665	0.9589	0.9822 (89)
MIT 2	18.1302	18.4868	18.9133	19.4098	19.7762	19.9778	20.0312	20.0256	19.9083	19.4255	18.6888	18.0666 (90)
Living area fraction	18.2207	18.5779	19.0055	19.5042	19.8749	20.0812	20.1377	20.1313	20.0087	19.5186	18.7792	18.1567 (92)
MIT	18.2207	18.5779	19.0055	19.5042	19.8749	20.0812	20.1377	20.1313	20.0087	19.5186	18.7792	18.1567 (92)
Temperature adjustment												0.0000
adjusted MIT	18.2207	18.5779	19.0055	19.5042	19.8749	20.0812	20.1377	20.1313	20.0087	19.5186	18.7792	18.1567 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9692	0.9405	0.8984	0.8175	0.6928	0.5209	0.3666	0.4082	0.6293	0.8500	0.9464	0.9745 (94)
Useful gains	939.3138	1152.6255	1260.2372	1287.5226	1157.4353	859.9097	581.5541	606.9696	876.2178	1016.4703	947.4519	882.3639 (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	2387.5153	2342.1646	2138.0703	1799.7642	1385.5514	923.0434	595.7595	627.5957	997.5050	1511.5972	1985.0186	2378.9882 (97)
Space heating kWh	1077.4620	799.3702	653.1078	368.8140	169.7184	0.0000	0.0000	0.0000	0.0000	368.3744	747.0480	1113.4885 (98a)
Space heating requirement - total per year (kWh/year)												5297.3834
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	1077.4620	799.3702	653.1078	368.8140	169.7184	0.0000	0.0000	0.0000	0.0000	368.3744	747.0480	1113.4885 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5297.3834
Space heating per m2										(98c) / (4) =		32.9030 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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	0.0000	0.0000	0.0000	0.0000	0.0000	1582.9710	1246.1687	1278.3183	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8263	0.8846	0.8601	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1307.9537	1102.3267	1099.5089	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1851.3022	1779.5136	1666.6594	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	391.2109	503.8271	421.9600	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	97.8027	125.9568	105.4900	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												329.2495 (107)
Energy for space heating												32.9030 (99)
Energy for space cooling												2.0450 (108)
Total												34.9480 (109)
Fabric Energy Efficiency (DFEE)												34.9 (109)

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

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

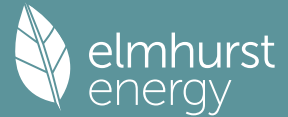
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	86.5000 (1b)	x 2.4000 (2b)	= 207.6000 (1b) - (3b)
First floor	74.5000 (1c)	x 2.6000 (2c)	= 193.7000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	161.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	401.3000 (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)

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Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											Air changes per hour	
Pressure test												40.0000 / (5) =	0.0997 (8)
Pressure Test Method												Yes	
Measured/design AP50												Blower Door	
Infiltration rate												5.0000 (17)	
Number of sides sheltered												0.3497 (18)	
												2 (19)	
Shelter factor												(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) =	0.2972 (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)	
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)	
	0.3790	0.3715	0.3641	0.3269	0.3195	0.2824	0.2824	0.2749	0.2972	0.3195	0.3344	0.3492 (22b)	
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)	
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)	
Effective ac	0.5718	0.5690	0.5663	0.5534	0.5510	0.5399	0.5399	0.5378	0.5442	0.5510	0.5559	0.5610 (25)	

3. Heat losses and heat loss parameter

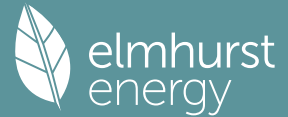
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Semi-glazed door			3.9200	1.0000	3.9200			(26a)
TER Opening Type			28.4300	1.1450	32.5534			(27)
Heatloss Floor 1			86.5000	0.1300	11.2450			(28a)
Brick	165.9500	29.9000	136.0500	0.1800	24.4890			(29a)
Cladding	23.2100	2.4500	20.7600	0.1800	3.7368			(29a)
Planned Roof	86.5000		86.5000	0.1100	9.5150			(30)
Total net area of external elements Aum(A, m2)			362.1600					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	85.4592		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								132.6501 (35)
List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		
E17 Corner (inverted - internal area greater than external area)				2.4000	-0.0900	-0.2160		
E12 Gable (insulation at ceiling level)				14.7400	0.0600	0.8844		
E10 Eaves (insulation at ceiling level)				29.9000	0.0600	1.7940		
E2 Other lintels (including other steel lintels)				20.3000	0.0500	1.0150		
E3 Sill				18.4400	0.0500	0.9220		
E4 Jamb				45.0000	0.0500	2.2500		
E5 Ground floor (normal)				40.9000	0.1600	6.5440		
E6 Intermediate floor within a dwelling				35.0000	0.0000	0.0000		
E16 Corner (normal)				27.2000	0.0900	2.4480		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								15.6414 (36)
Point Thermal bridges								(36a) = 0.0000
Total fabric heat loss								(33) + (36) + (36a) = 101.1006 (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
	75.7237	75.3544	74.9925	73.2925	72.9744	71.4937	71.4937	71.2195	72.0641	72.9744	73.6178	74.2905 (38)
Heat transfer coeff	176.8243	176.4551	176.0931	174.3931	174.0750	172.5944	172.5944	172.3202	173.1647	174.0750	174.7185	175.3912 (39)
Average = Sum(39)m / 12 =												174.3916
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0983	1.0960	1.0937	1.0832	1.0812	1.0720	1.0720	1.0703	1.0756	1.0812	1.0852	1.0894 (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												2.9503 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	31.8109	31.3385	30.6732	29.4465	28.5280	27.5095	26.9594	27.6200	28.3393	29.4292	30.6811	31.7034 (42b)
Hot water usage for other uses	44.8441	43.2134	41.5827	39.9520	38.3213	36.6906	36.6906	38.3213	39.9520	41.5827	43.2134	44.8441 (42c)
Average daily hot water use (litres/day)												70.2611 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	76.6550	74.5519	72.2559	69.3985	66.8493	64.2001	63.6500	65.9413	68.2913	71.0119	73.8945	76.5475 (44)
Distribution loss (46)m = 0.15 x (45)m	121.4028	106.1609	111.0546	95.0031	89.9920	78.9416	76.9792	81.6491	84.2100	96.3624	105.2762	119.8549 (45)
Water storage loss:	Total = Sum(45)m =											1166.8870
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (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 (59)
Total heat required for water heating calculated for each month	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)
WWHRS	103.1924	90.2368	94.3964	80.7527	76.4932	67.1003	65.4323	69.4018	71.5785	81.9081	89.4848	101.8766 (62)
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 (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)
12Total per year (kWh/year)	103.1924	90.2368	94.3964	80.7527	76.4932	67.1003	65.4323	69.4018	71.5785	81.9081	89.4848	101.8766 (64)
Electric shower(s)	Total per year (kWh/year) = Sum(64)m =											991.8539 (64)
Heat gains from water heating, kWh/month	59.0108	52.5791	57.4144	54.7899	55.8180	53.2449	55.0198	55.8180	54.7899	57.4144	56.3348	59.0108 (64a)
	40.5508	35.7040	37.9527	33.8856	33.0778	30.0863	30.1130	31.3049	31.5921	34.8306	36.4549	40.2219 (65)

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	147.5153	147.5153	147.5153	147.5153	147.5153	147.5153	147.5153	147.5153	147.5153	147.5153	147.5153	147.5153 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	171.6994	190.0958	171.6994	177.4228	171.6994	177.4228	171.6994	171.6994	177.4228	171.6994	177.4228	171.6994 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	332.2527	335.7004	327.0122	308.5161	285.1680	263.2241	248.5642	245.1165	253.8047	272.3009	295.6489	317.5928 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7515	37.7515	37.7515	37.7515	37.7515	37.7515	37.7515	37.7515	37.7515	37.7515	37.7515	37.7515 (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)	-118.0122	-118.0122	-118.0122	-118.0122	-118.0122	-118.0122	-118.0122	-118.0122	-118.0122	-118.0122	-118.0122	-118.0122 (71)
Water heating gains (Table 5)	54.5038	53.1309	51.0117	47.0634	44.4594	41.7865	40.4745	42.0765	43.8779	46.8153	50.6318	54.0616 (72)
Total internal gains	625.7105	646.1817	616.9780	600.2568	568.5814	549.6880	527.9928	526.1471	542.3600	558.0702	590.9581	610.6085 (73)

6. Solar gains

[Jan]	Area m ²		Solar flux Table 6a W/m ²		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
North	11.3700		10.6334		0.6300		0.7000		0.7700		36.9491 (74)	
East	1.6200		19.6403		0.6300		0.7000		0.7700		9.7238 (76)	
South	15.4400		46.7521		0.6300		0.7000		0.7700		220.6073 (78)	
Solar gains	267.2802	450.9313	611.5420	758.5755	857.6532	856.8899	823.7280	747.7058	661.4602	496.3186	319.2008	229.4240 (83)
Total gains	892.9907	1097.1131	1228.5200	1358.8323	1426.2346	1406.5779	1351.7207	1273.8529	1203.8202	1054.3888	910.1589	840.0325 (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	33.5497	33.6199	33.6890	34.0174	34.0796	34.3720	34.3720	34.4267	34.2588	34.0796	33.9541	33.8239
alpha	3.2366	3.2413	3.2459	3.2678	3.2720	3.2915	3.2915	3.2951	3.2839	3.2720	3.2636	3.2549
util living area	0.9854	0.9714	0.9495	0.9003	0.8119	0.6674	0.5215	0.5656	0.7637	0.9209	0.9742	0.9879 (86)
MIT	18.7720	19.0908	19.5074	20.0426	20.5021	20.8204	20.9410	20.9218	20.7019	20.0933	19.3364	18.7191 (87)
Th 2	20.0022	20.0041	20.0059	20.0146	20.0162	20.0238	20.0238	20.0252	20.0208	20.0162	20.0129	20.0095 (88)
util rest of house	0.9826	0.9661	0.9397	0.8800	0.7716	0.5950	0.4205	0.4653	0.7018	0.9007	0.9685	0.9856 (89)
MIT 2	17.9612	18.2776	18.6888	19.2130	19.6412	19.9162	19.9994	19.9906	19.8255	19.2715	18.5298	17.9137 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.0537	18.3704	18.7822	19.3076	19.7394	20.0194	20.1068	20.0968	19.9255	19.3653	18.6219	18.0056 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.0537	18.3704	18.7822	19.3076	19.7394	20.0194	20.1068	20.0968	19.9255	19.3653	18.6219	18.0056 (93)

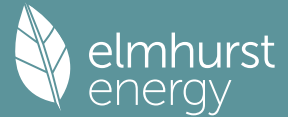
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9749	0.9543	0.9243	0.8624	0.7586	0.5946	0.4296	0.4732	0.6949	0.8838	0.9575	0.9789 (94)
Useful gains	870.5991	1047.0250	1135.4606	1171.8539	1081.9530	836.3529	580.7389	602.8308	836.5332	931.9097	871.4627	822.3484 (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	2431.9844	2376.9226	2162.8159	1815.0173	1399.4628	935.3586	605.2613	637.0368	1008.7781	1525.8127	2013.0810	2421.3815 (97)
Space heating kWh	1161.6707	893.6911	764.3524	463.0777	236.2273	0.0000	0.0000	0.0000	0.0000	441.8638	821.9651	1189.6807 (98a)
Space heating requirement - total per year (kWh/year)												5972.5287
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	1161.6707	893.6911	764.3524	463.0777	236.2273	0.0000	0.0000	0.0000	0.0000	441.8638	821.9651	1189.6807 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5972.5287
Space heating per m ²												(98c) / (4) = 37.0965 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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	0.0000	0.0000	0.0000	0.0000	0.0000	1622.3870	1277.1982	1309.6332	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7532	0.8256	0.7966	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1221.9981	1054.4520	1043.2534	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1565.8993	1505.1560	1417.6223	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	247.6089	335.3238	278.5305	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fC = cooled area / (4) =											
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	61.9022	83.8309	69.6326	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												215.3658 (107)
Energy for space heating												37.0965 (99)
Energy for space cooling												1.3377 (108)
Total												38.4341 (109)
Fabric Energy Efficiency (TFEE)												38.4 (109)

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Property Reference	P19 Ladds			Issued on Date	21/08/2025
Assessment Reference	Detached	Prop Type Ref	Semi		
Property	1, Bath Road, Hare Hatch, Berkshire, RG10 9SA				
SAP Rating	82 B	DER	3.56	TER	8.49
Environmental	96 A	% DER < TER			58.07
CO ₂ Emissions (t/year)	0.51	DFEE	34.95	TFEE	38.43
Compliance Check	See BREL	% DFEE < TFEE			9.07
% DPER < TPER	17.08	DPER	36.93	TPER	44.53
Assessor Details	Mrs. Rebecca Lennon			Assessor ID	P627-0001
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	86.5000 (1b)	x 2.4000 (2b)	= 207.6000 (1b) - (3b)
First floor	74.5000 (1c)	x 2.6000 (2c)	= 193.7000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	161.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 401.3000 (5)

2. Ventilation rate

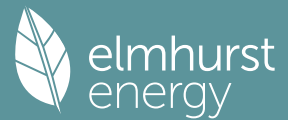
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	1 * 20 = 20.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	5 * 10 = 50.0000 (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) =	70.0000 / (5) = 0.1744 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3744 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3183 (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	0.4058	0.3978	0.3899	0.3501	0.3421	0.3024	0.3024	0.2944	0.3183	0.3421	0.3581	0.3740 (22b)
Effective ac	0.5823	0.5791	0.5760	0.5613	0.5585	0.5457	0.5457	0.5433	0.5506	0.5585	0.5641	0.5699 (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							
Ent Door			1.9600	1.2000	2.3520		(26a)
Windows			28.4300	1.1450	32.5534		(27)
Side Door			1.9600	1.2000	2.3520		(26a)
Heatloss Floor 1			86.5000	0.1200	10.3800	75.0000	6487.5000 (28a)
Brick	165.9500	29.9000	136.0500	0.2000	27.2100	60.0000	8163.0000 (29a)
Cladding	23.2100	2.4500	20.7600	0.1900	3.9444	60.0000	1245.6000 (29a)
Planned Roof	86.5000		86.5000	0.0900	7.7850	9.0000	778.5000 (30)
Total net area of external elements Aum(A, m ²)			362.1600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		86.5768		(33)
Main dwelling							
Internal Wall 1			296.6100			9.0000	2669.4900 (32c)
Internal Floor 1			74.5400			18.0000	1341.7200 (32d)
Internal Ceiling 1			74.5400			9.0000	670.8600 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	21356.6700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							132.6501 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E17 Corner (inverted - internal area greater than external area)				2.4000	-0.0510	-0.1224	

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E12 Gable (insulation at ceiling level)						14.7400	0.0730	1.0760				
E10 Eaves (insulation at ceiling level)						29.9000	0.0840	2.5116				
E2 Other lintels (including other steel lintels)						20.3000	0.0480	0.9744				
E3 Sill						18.4400	0.0450	0.8298				
E4 Jamb						45.0000	0.0510	2.2950				
E5 Ground floor (normal)						40.9000	0.0640	2.6176				
E6 Intermediate floor within a dwelling						35.0000	0.0000	0.0000				
E16 Corner (normal)						27.2000	0.0570	1.5504				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												11.7324 (36)
Point Thermal bridges												0.0000
Total fabric heat loss												(33) + (36) + (36a) = 98.3093 (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	77.1178	76.6945	76.2794	74.3302	73.9655	72.2677	72.2677	71.9533	72.9217	73.9655	74.7033	75.4746 (38)
Average = Sum(39)m / 12 =	175.4271	175.0037	174.5887	172.6394	172.2747	170.5770	170.5770	170.2626	171.2309	172.2747	173.0125	173.7838 (39)
												172.6377
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0896	1.0870	1.0844	1.0723	1.0700	1.0595	1.0595	1.0575	1.0635	1.0700	1.0746	1.0794 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31
												1.0723

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.9503 (42)
Hot water usage for mixer showers												
	73.6868	72.5794	70.9658	67.8783	65.5999	63.0590	61.6147	63.2162	64.9716	67.6998	70.8535	73.4045 (42a)
Hot water usage for baths												
	31.8109	31.3385	30.6732	29.4465	28.5280	27.5095	26.9594	27.6200	28.3393	29.4292	30.6811	31.7034 (42b)
Hot water usage for other uses												
	44.8441	43.2134	41.5827	39.9520	38.3213	36.6906	36.6906	38.3213	39.9520	41.5827	43.2134	44.8441 (42c)
Average daily hot water use (litres/day)												138.1978 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	150.3418	147.1313	143.2217	137.2769	132.4492	127.2591	125.2647	129.1575	133.2630	138.7116	144.7480	149.9519 (44)
Energy content (annual)	238.1047	209.5130	220.1264	187.9252	178.3021	156.4799	151.4968	159.9239	164.3266	188.2304	206.2201	234.7885 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 2295.4375
	35.7157	31.4270	33.0190	28.1888	26.7453	23.4720	22.7245	23.9886	24.6490	28.2346	30.9330	35.2183 (46)
Water storage loss:												
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.1000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.5940 (55)
Total storage loss												
	18.4140	16.6320	18.4140	17.8200	18.4140	17.8200	18.4140	18.4140	17.8200	18.4140	17.8200	18.4140 (56)
If cylinder contains dedicated solar storage												
	18.4140	16.6320	18.4140	17.8200	18.4140	17.8200	18.4140	18.4140	17.8200	18.4140	17.8200	18.4140 (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												
	279.7811	247.1562	261.8028	228.2572	219.9785	196.8119	193.1732	201.6003	204.6586	229.9068	246.5521	276.4649 (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	279.7811	247.1562	261.8028	228.2572	219.9785	196.8119	193.1732	201.6003	204.6586	229.9068	246.5521	276.4649 (64)
12Total per year (kWh/year)												2786.1435 (64)
Electric shower(s)												2786 (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												
	112.5109	99.7776	106.5331	94.7507	92.6266	84.2952	83.7138	86.5158	86.9042	95.9277	100.8338	111.4083 (65)

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

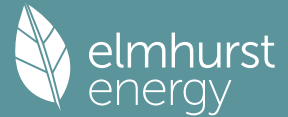
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	147.5153	147.5153	147.5153	147.5153	147.5153	147.5153	147.5153	147.5153	147.5153	147.5153	147.5153	147.5153 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	171.6994	190.0958	171.6994	177.4228	171.6994	177.4228	171.6994	171.6994	177.4228	171.6994	177.4228	171.6994 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	332.2527	335.7004	327.0122	308.5161	285.1680	263.2241	248.5642	245.1165	253.8047	272.3009	295.6489	317.5928 (68)
Pumps, fans	37.7515	37.7515	37.7515	37.7515	37.7515	37.7515	37.7515	37.7515	37.7515	37.7515	37.7515	37.7515 (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)
Water heating gains (Table 5)	-118.0122	-118.0122	-118.0122	-118.0122	-118.0122	-118.0122	-118.0122	-118.0122	-118.0122	-118.0122	-118.0122	-118.0122 (71)
Total internal gains	151.2244	148.4786	143.1897	131.5982	124.4981	117.0766	112.5186	116.2847	120.7003	128.9351	140.0469	149.7423 (72)
	722.4311	741.5295	709.1560	684.7916	648.6201	624.9781	600.0368	600.3552	619.1823	640.1900	680.3732	706.2892 (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			11.3700	10.6334	0.5100	0.0000	0.7700	47.4781 (74)				
East			1.6200	19.6403	0.5100	0.0000	0.7700	12.4946 (76)				
South			15.4400	46.7521	0.5100	0.0000	0.7700	283.4712 (78)				

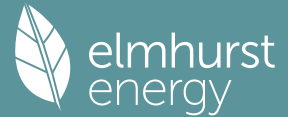
Solar gains	343.4439	579.4280	785.8061	974.7380	1102.0487	1101.0679	1058.4562	960.7709	849.9489	637.7487	410.1597	294.8003 (83)
Total gains	1065.8750	1320.9575	1494.9621	1659.5296	1750.6688	1726.0460	1658.4930	1561.1262	1469.1312	1277.9387	1090.5329	1001.0895 (84)

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7. Mean internal temperature (heating season)												
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	33.8169	33.8988	33.9793	34.3630	34.4357	34.7785	34.7785	34.8427	34.6457	34.4357	34.2889	34.1367
alpha	3.2545	3.2599	3.2653	3.2909	3.2957	3.3186	3.3186	3.3228	3.3097	3.2957	3.2859	3.2758
util living area	0.9760	0.9532	0.9180	0.8464	0.7321	0.5735	0.4341	0.4751	0.6785	0.8770	0.9579	0.9801 (86)
Living	19.3786	19.6452	19.9676	20.3506	20.6462	20.8243	20.8823	20.8735	20.7566	20.3614	19.8023	19.3349
Non living	18.1042	18.4415	18.8454	19.3195	19.6620	19.8539	19.9024	19.8984	19.7902	19.3443	18.6511	18.0548
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	20.1706	19.6452	19.9676	20.3506	20.6462	20.8243	20.8823	20.8735	20.7566	20.3614	19.8023	19.5678 (87)
Th 2	20.0093	20.0115	20.0136	20.0235	20.0254	20.0341	20.0341	20.0357	20.0307	20.0254	20.0216	20.0177 (88)
util rest of house	0.9716	0.9451	0.9037	0.8195	0.6858	0.5031	0.3459	0.3852	0.6123	0.8495	0.9492	0.9764 (89)
MIT 2	19.2498	18.4415	18.8454	19.3195	19.6620	19.8539	19.9024	19.8984	19.7902	19.3443	18.6511	18.4085 (90)
Living area fraction	19.3549	18.5788	18.9735	19.4371	19.7743	19.9646	20.0142	20.0097	19.9005	19.4603	18.7825	18.5408 (91)
MIT	19.3549	18.5788	18.9735	19.4371	19.7743	19.9646	20.0142	20.0097	19.9005	19.4603	18.7825	18.5408 (92)
Temperature adjustment	19.3549	18.5788	18.9735	19.4371	19.7743	19.9646	20.0142	20.0097	19.9005	19.4603	18.7825	0.0000
adjusted MIT	19.3549	18.5788	18.9735	19.4371	19.7743	19.9646	20.0142	20.0097	19.9005	19.4603	18.7825	18.5408 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9682	0.9299	0.8851	0.8008	0.6727	0.4977	0.3440	0.3827	0.6025	0.8302	0.9347	0.9692 (94)
Useful gains	1031.9889	1228.3676	1323.2174	1329.0305	1177.6188	859.1237	570.5330	597.4590	885.1579	1060.9658	1019.3644	970.2777 (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	2641.0351	2393.8431	2177.7254	1819.1275	1390.9909	915.0736	582.3855	614.5913	993.2217	1526.4084	2021.2132	2492.1926 (97)
Space heating kWh	1197.1303	783.1995	635.7539	352.8699	158.7489	0.0000	0.0000	0.0000	0.0000	346.2893	721.3311	1132.3047 (98a)
Space heating requirement - total per year (kWh/year)												5327.6277
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	1197.1303	783.1995	635.7539	352.8699	158.7489	0.0000	0.0000	0.0000	0.0000	346.2893	721.3311	1132.3047 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5327.6277
Space heating per m2										(98c) / (4) =		33.0909 (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 %)												283.3667 (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	1197.1303	783.1995	635.7539	352.8699	158.7489	0.0000	0.0000	0.0000	0.0000	346.2893	721.3311	1132.3047 (98)
Space heating efficiency (main heating system 1)	283.3667	283.3667	283.3667	283.3667	283.3667	0.0000	0.0000	0.0000	0.0000	283.3667	283.3667	283.3667 (210)
Space heating fuel (main heating system)	422.4668	276.3908	224.3573	124.5276	56.0224	0.0000	0.0000	0.0000	0.0000	122.2054	254.5575	399.5899 (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	279.7811	247.1562	261.8028	228.2572	219.9785	196.8119	193.1732	201.6003	204.6586	229.9068	246.5521	276.4649 (64)
Efficiency of water heater (217)m	177.3117	177.3117	177.3117	177.3117	177.3117	177.3117	177.3117	177.3117	177.3117	177.3117	177.3117	177.3117 (216)
Fuel for water heating, kWh/month	157.7905	139.3908	147.6512	128.7322	124.0632	110.9977	108.9456	113.6983	115.4231	129.6625	139.0501	155.9203 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	45.6245	36.6017	32.9558	24.1448	18.6501	15.2373	17.0133	22.1145	28.7246	37.6882	42.5687	46.8926 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1880.1176 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												177.3117
Water heating fuel used												1571.3254 (219)
Space cooling fuel												0.0000 (221)

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Electricity for pumps and fans:
 Total electricity for the above, kWh/year 0.0000 (231)
 Electricity for lighting (calculated in Appendix L) 368.2160 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
 PV generation 0.0000 (233)
 Wind generation 0.0000 (234)
 Hydro-electric generation (Appendix N) 0.0000 (235a)
 Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
 Appendix Q - special features
 Energy saved or generated -0.0000 (236)
 Energy used 0.0000 (237)
 Total delivered energy for all uses 3819.6591 (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 (high-rate cost)	1504.0941	0.1634	245.7860 (261)
Space heating - main system 1 (low-rate cost)	376.0235	0.1372	51.5846 (261)
Total CO2 associated with community systems			0.0000 (261)
Water heating - high rate cost	1099.9278	0.1480	162.8117 (264)
Water heating - low rate cost	471.3976	0.1242	58.5618 (264)
Space and water heating			518.7442 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	368.2160	0.1490	54.8715 (268)
Total CO2, kg/year			573.6156 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.5600 (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 (high-rate cost)	1504.0941	1.2873	2420.3082 (275)
Space heating - main system 1 (low-rate cost)	376.0235	1.4966	562.7470 (275)
Total CO2 associated with community systems			0.0000 (275)
Water heating - high rate cost	1099.9278	1.5533	1708.5077 (278)
Water heating - low rate cost	471.3976	1.4446	680.9866 (278)
Space and water heating			5372.5495 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	368.2160	1.5547	572.4819 (282)
Total Primary energy kWh/year			5945.0313 (286)
Dwelling Primary energy Rate (DPER)			36.9300 (287)

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

1. Overall dwelling characteristics

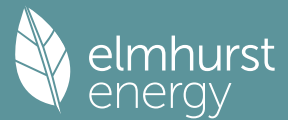
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	86.5000 (1b)	x 2.4000 (2b)	= 207.6000 (1b) - (3b)
First floor	74.5000 (1c)	x 2.6000 (2c)	= 193.7000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	161.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 401.3000 (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) = 0.0997 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3497 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2972 (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	0.3790	0.3715	0.3641	0.3269	0.3195	0.2824	0.2824	0.2749	0.2972	0.3195	0.3344	0.3492 (22b)
Effective ac	0.5718	0.5690	0.5663	0.5534	0.5510	0.5399	0.5399	0.5378	0.5442	0.5510	0.5559	0.5610 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Semi-glazed door			3.9200	1.0000	3.9200			(26a)
TER Opening Type			28.4300	1.1450	32.5534			(27)
Heatloss Floor 1			86.5000	0.1300	11.2450			(28a)
Brick	165.9500	29.9000	136.0500	0.1800	24.4890			(29a)
Cladding	23.2100	2.4500	20.7600	0.1800	3.7368			(29a)
Planned Roof	86.5000		86.5000	0.1100	9.5150			(30)
Total net area of external elements Aum(A, m2)			362.1600					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	85.4592		(33)

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

132.6501 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E17 Corner (inverted - internal area greater than external area)	2.4000	-0.0900	-0.2160	
E12 Gable (insulation at ceiling level)	14.7400	0.0600	0.8844	
E10 Eaves (insulation at ceiling level)	29.9000	0.0600	1.7940	
E2 Other lintels (including other steel lintels)	20.3000	0.0500	1.0150	
E3 Sill	18.4400	0.0500	0.9220	
E4 Jamb	45.0000	0.0500	2.2500	
E5 Ground floor (normal)	40.9000	0.1600	6.5440	
E6 Intermediate floor within a dwelling	35.0000	0.0000	0.0000	
E16 Corner (normal)	27.2000	0.0900	2.4480	

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

15.6414 (36)

Point Thermal Bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 101.1006 (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	75.7237	75.3544	74.9925	73.2925	72.9744	71.4937	71.4937	71.2195	72.0641	72.9744	73.6178	74.2905	(38)
Heat transfer coeff	176.8243	176.4551	176.0931	174.3931	174.0750	172.5944	172.5944	172.3202	173.1647	174.0750	174.7185	175.3912	(39)
Average = Sum(39)m / 12 =												174.3916	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0983	1.0960	1.0937	1.0832	1.0812	1.0720	1.0720	1.0703	1.0756	1.0812	1.0852	1.0894	(40)
HLP (average)												1.0832	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

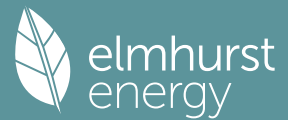
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9503 (42)
Hot water usage for mixer showers	73.6868	72.5794	70.9658	67.8783	65.5999	63.0590	61.6147	63.2162	64.9716	67.6998	70.8535	73.4045	(42a)
Hot water usage for baths	31.8109	31.3385	30.6732	29.4465	28.5280	27.5095	26.9594	27.6200	28.3393	29.4292	30.6811	31.7034	(42b)
Hot water usage for other uses	44.8441	43.2134	41.5827	39.9520	38.3213	36.6906	36.6906	38.3213	39.9520	41.5827	43.2134	44.8441	(42c)
Average daily hot water use (litres/day)													138.1978 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	150.3418	147.1313	143.2217	137.2769	132.4492	127.2591	125.2647	129.1575	133.2630	138.7116	144.7480	149.9519	(44)
Energy conte	238.1047	209.5130	220.1264	187.9252	178.3021	156.4799	151.4968	159.9239	164.3266	188.2304	206.2201	234.7885	(45)
Energy content (annual)										Total =	Sum(45)m =	2295.4375	
Distribution loss (46)m = 0.15 x (45)m	35.7157	31.4270	33.0190	28.1888	26.7453	23.4720	22.7245	23.9886	24.6490	28.2346	30.9330	35.2183	(46)
Water storage loss:													
Store volume													250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.8903 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.0208 (55)
Total storage loss	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(56)
If cylinder contains dedicated solar storage	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(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	293.0115	259.1062	275.0332	241.0608	233.2089	209.6155	206.4036	214.8307	217.4622	243.1372	259.3557	289.6953	(62)
WWHRS	-33.6865	-29.7926	-31.1971	-25.8325	-24.0749	-20.6011	-19.3102	-20.5345	-21.3147	-25.1276	-28.4666	-33.0627	(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	(64a)
Output from w/h	259.3249	229.3136	243.8360	215.2283	209.1339	189.0144	187.0934	194.2962	196.1475	218.0095	230.8891	256.6326	(64)
								Total per year (kWh/year) =	Sum(64)m =			2628.9196	(64)
12Total per year (kWh/year)												2629	(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	123.0952	109.3377	117.1174	104.9936	103.2109	94.5381	94.2981	97.1001	97.1471	106.5120	111.0767	121.9926	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	147.5153	147.5153	147.5153	147.5153	147.5153	147.5153	147.5153	147.5153	147.5153	147.5153	147.5153	147.5153	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	171.6994	190.0958	171.6994	177.4228	171.6994	177.4228	171.6994	171.6994	177.4228	171.6994	177.4228	171.6994	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	332.2527	335.7004	327.0122	308.5161	285.1680	263.2241	248.5642	245.1165	253.8047	272.3009	295.6489	317.5928	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7515	37.7515	37.7515	37.7515	37.7515	37.7515	37.7515	37.7515	37.7515	37.7515	37.7515	37.7515	(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)	-118.0122	-118.0122	-118.0122	-118.0122	-118.0122	-118.0122	-118.0122	-118.0122	-118.0122	-118.0122	-118.0122	-118.0122	(71)
Water heating gains (Table 5)	165.4506	162.7049	157.4159	145.8244	138.7243	131.3029	126.7448	130.5109	134.9265	143.1613	154.2731	163.9686	(72)

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Total internal gains
739.6573 758.7557 726.3822 702.0179 665.8463 639.2043 614.2631 614.5815 633.4085 657.4162 697.5994 723.5154 (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					11.3700	10.6334	0.6300	0.7000	0.7700			36.9491 (74)
East					1.6200	19.6403	0.6300	0.7000	0.7700			9.7238 (76)
South					15.4400	46.7521	0.6300	0.7000	0.7700			220.6073 (78)
Solar gains	267.2802	450.9313	611.5420	758.5755	857.6532	856.8899	823.7280	747.7058	661.4602	496.3186	319.2008	229.4240 (83)
Total gains	1006.9375	1209.6870	1337.9242	1460.5934	1523.4995	1496.0942	1437.9910	1362.2873	1294.8687	1153.7348	1016.8002	952.9394 (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	33.5497	33.6199	33.6890	34.0174	34.0796	34.3720	34.3720	34.4267	34.2588	34.0796	33.9541	33.8239
alpha	3.2366	3.2413	3.2459	3.2678	3.2720	3.2915	3.2915	3.2951	3.2839	3.2720	3.2636	3.2549
util living area	0.9795	0.9629	0.9376	0.8832	0.7886	0.6406	0.4955	0.5366	0.7349	0.9028	0.9652	0.9827 (86)
MIT	18.8863	19.1974	19.6021	20.1146	20.5491	20.8416	20.9493	20.9332	20.7368	20.1695	19.4387	18.8339 (87)
Th 2	20.0022	20.0041	20.0059	20.0146	20.0162	20.0238	20.0238	20.0252	20.0208	20.0162	20.0129	20.0095 (88)
util rest of house	0.9758	0.9563	0.9260	0.8606	0.7460	0.5679	0.3977	0.4388	0.6706	0.8792	0.9578	0.9795 (89)
MIT 2	17.5281	17.9224	18.4324	19.0707	19.5850	19.9036	19.9973	19.9878	19.8030	19.1502	18.2378	17.4660 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	17.6830	18.0679	18.5659	19.1898	19.6950	20.0107	20.1059	20.0957	19.9096	19.2665	18.3748	17.6221 (92)
Temperature adjustment												0.0000
adjusted MIT	17.6830	18.0679	18.5659	19.1898	19.6950	20.0107	20.1059	20.0957	19.9096	19.2665	18.3748	17.6221 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9628	0.9383	0.9040	0.8376	0.7302	0.5669	0.4063	0.4464	0.6624	0.8566	0.9406	0.9680 (94)
Useful gains	969.5286	1135.1011	1209.5007	1223.3880	1112.4078	848.1098	584.2990	608.0593	857.7731	988.2615	956.3656	922.4129 (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	2366.4478	2323.5399	2124.7163	1794.4721	1391.7246	933.8485	605.0961	636.8393	1006.0122	1508.6234	1969.9172	2354.1173 (97)
Space heating kWh	1039.3079	798.6309	680.9204	411.1806	207.8117	0.0000	0.0000	0.0000	0.0000	387.1493	729.7572	1065.1881 (98a)
Space heating requirement - total per year (kWh/year)												5319.9461
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	1039.3079	798.6309	680.9204	411.1806	207.8117	0.0000	0.0000	0.0000	0.0000	387.1493	729.7572	1065.1881 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5319.9461
Space heating per m2										(98c) / (4) =		33.0431 (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	1039.3079	798.6309	680.9204	411.1806	207.8117	0.0000	0.0000	0.0000	0.0000	387.1493	729.7572	1065.1881 (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)	1126.0107	865.2556	737.7253	445.4828	225.1482	0.0000	0.0000	0.0000	0.0000	419.4467	790.6361	1154.0499 (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	259.3249	229.3136	243.8360	215.2283	209.1339	189.0144	187.0934	194.2962	196.1475	218.0095	230.8891	256.6326 (64)
Efficiency of water heater												79.8000 (216)
(217)m	86.8441	86.6207	86.2355	85.4873	84.0456	79.8000	79.8000	79.8000	79.8000	85.3329	86.4564	86.8972 (217)
Fuel for water heating, kWh/month	298.6096	264.7331	282.7558	251.7664	248.8340	236.8602	234.4528	243.4790	245.7989	255.4811	267.0584	295.3288 (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	35.6758	28.6204	25.7695	18.8798	14.5833	11.9147	13.3034	17.2923	22.4610	29.4700	33.2863	36.6673 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-73.1024	-99.3030	-137.5435	-148.7527	-155.4803	-143.2365	-141.2730	-135.6064	-125.1241	-110.4986	-78.9368	-63.6343 (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)												

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(233b)m	-53.5507	-110.9824	-217.6593	-322.8478	-423.1480	-423.9727	-419.1509	-356.7326	-263.8305	-157.5369	-71.0850	-42.4908	(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												5763.7552	(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												3125.1582	(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)												287.9238	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-4275.4792	(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												4987.3580	(238)

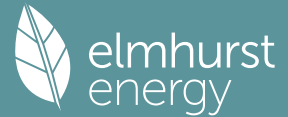
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	5763.7552	0.2100	1210.3886	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3125.1582	0.2100	656.2832	(264)
Space and water heating			1866.6718	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	287.9238	0.1443	41.5563	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1412.4916	0.1354	-191.2858	
PV Unit electricity exported	-2862.9876	0.1263	-361.4794	
Total			-552.7652	(269)
Total CO2, kg/year			1367.3922	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.4900	(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	5763.7552	1.1300	6513.0434	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3125.1582	1.1300	3531.4288	(278)
Space and water heating			10044.4722	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	287.9238	1.5338	441.6271	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1412.4916	1.5006	-2119.5170	
PV Unit electricity exported	-2862.9876	0.4635	-1326.9226	
Total			-3446.4397	(283)
Total Primary energy kWh/year			7169.7604	(286)
Target Primary Energy Rate (TPER)			44.5300	(287)

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Property Reference	P1 Ladds				Issued on Date	27/08/2025
Assessment Reference	Grd Flr Flat edle			Prop Type Ref	Semi	
Property	1, Bath Road, Hare Hatch, Berkshire, RG10 9SA					
SAP Rating	84 B	DER	5.20	TER	12.80	
Environmental	97 A	% DER < TER				59.38
CO ₂ Emissions (t/year)	0.2	DFEE	31.45	TFEE	31.50	
Compliance Check	See BREL	% DFEE < TFEE				0.17
% DPER < TPER	21.29	DPER	52.87	TPER	67.18	
Assessor Details	Mrs. Naomi Sadler				Assessor ID	4611-0001
Client	Westbourne Homes, Westbourne Homes					

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	49.7000 (1b)	2.4000 (2b)	119.2800 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.7000		119.2800 (4)
Dwelling volume			119.2800 (5)

2. Ventilation rate

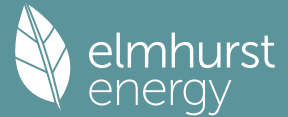
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	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) = 0.1677 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.3177 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2700 (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	0.3443	0.3375	0.3308	0.2970	0.2903	0.2565	0.2565	0.2498	0.2700	0.2903	0.3038	0.3173 (22b)
Effective ac	0.5593	0.5570	0.5547	0.5441	0.5421	0.5329	0.5329	0.5312	0.5365	0.5421	0.5461	0.5503 (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							
Ent Door			1.9600	1.2000	2.3520		(26a)
Windows			7.8300	1.1450	8.9656		(27)
Heatloss Floor 1			49.7000	0.1200	5.9640	75.0000	3727.5000 (28a)
External Wall 1	35.7600	9.7900	25.9700	0.2000	5.1940	60.0000	1558.2000 (29a)
Total net area of external elements Aum(A, m ²)			85.4600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.4756		(33)
Main dwelling							
Party Wall 1			36.9600	0.0000	0.0000	70.0000	2587.2000 (32)
Party Ceiling 1			49.7000			20.0000	994.0000 (32b)
Internal Wall 1			69.1200			9.0000	622.0800 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9488.9800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							190.9252 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				5.7300	0.0480	0.2750	
E3 Sill				4.8000	0.0450	0.2160	
E4 Jamb				13.8000	0.0510	0.7038	
E5 Ground floor (normal)				14.9000	0.0640	0.9536	
E16 Corner (normal)				2.4000	0.0570	0.1368	

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E18 Party wall between dwellings												
P1 Party wall - Ground floor												
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												
Point Thermal bridges												
Total fabric heat loss												
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	22.0140	21.9234	21.8346	21.4175	21.3395	20.9763	20.9763	20.9090	21.1162	21.3395	21.4974	21.6624 (38)
Average = Sum(39)m / 12 =	52.0004	51.9099	51.8211	51.4040	51.3260	50.9628	50.9628	50.8955	51.1027	51.3260	51.4838	51.6489 (39)
												51.4037
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0463	1.0445	1.0427	1.0343	1.0327	1.0254	1.0254	1.0241	1.0282	1.0327	1.0359	1.0392 (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													1.6813 (42)
Hot water usage for mixer showers													
Hot water usage for baths	51.0848	50.3027	49.1501	47.3770	45.7883	43.5658	41.8079	43.8630	44.8966	47.0979	49.3904	51.0387 (42a)	
Hot water usage for other uses	22.1556	21.8212	21.3454	20.6328	19.9907	19.1067	18.4360	19.2561	19.6865	20.5624	21.4731	22.1380 (42b)	
Average daily hot water use (litres/day)	31.8479	30.6898	29.5317	28.3736	27.2155	26.0574	26.0574	27.2155	28.3736	29.5317	30.6898	31.8479 (42c)	
													96.5923 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	105.0883	102.8136	100.0271	96.3834	92.9945	88.7298	86.3013	90.3346	92.9567	97.1920	101.5532	105.0246 (44)	
Energy content (annual)	154.7081	136.0432	142.9367	125.9008	119.8328	102.6131	95.3655	106.3254	107.8251	125.2417	137.2526	154.2364 (45)	
Distribution loss (46)m = 0.15 x (45)m	23.2062	20.4065	21.4405	18.8851	17.9749	15.3920	14.3048	15.9488	16.1738	18.7863	20.5879	23.1355 (46)	
Water storage loss:													
Store volume													201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6100 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)	
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	
Total heat required for water heating calculated for each month	181.6595	160.3864	169.8881	151.9828	146.7842	128.6951	122.3169	133.2768	133.9071	152.1931	163.3346	181.1878 (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	-2.2892	-4.9981	-10.3377	-16.1673	-22.0191	-22.3822	-22.0802	-18.3431	-13.0210	-7.3100	-3.1034	-1.7956 (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	179.3703	155.3883	159.5504	135.8155	124.7651	106.3129	100.2366	114.9338	120.8861	144.8831	160.2312	179.3922 (64)	
12Total per year (kWh/year)													1681.7657 (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	51.4404	45.2344	47.5265	41.8620	39.8444	34.1189	31.7090	35.3532	35.8518	41.6429	45.6365	51.2836 (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	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636 (66)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	77.3042	85.5868	77.3042	79.8810	77.3042	79.8810	77.3042	77.3042	79.8810	77.3042	79.8810	77.3042 (67)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	146.4548	147.9745	144.1448	135.9919	125.7002	116.0275	109.5655	108.0457	111.8754	120.0284	130.3201	139.9928 (68)	
Pumps, fans	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064 (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)	
Water heating gains (Table 5)	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509 (71)	
Total internal gains	69.1404	67.3131	63.8796	58.1417	53.5543	47.3873	42.6197	47.5178	49.7942	55.9716	63.3840	68.9296 (72)	
	341.1185	349.0935	333.5478	322.2336	304.7778	291.5148	277.7084	281.0868	289.7698	301.5233	321.8042	334.4457 (73)	

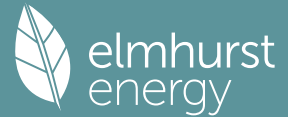
6. Solar gains

[Jan]													
	Area												
	m2												
North	5.4000												22.5490 (74)
South	2.4300												44.6137 (78)
Solar gains	67.1626	116.1579	166.2969	222.8092	268.0576	275.1069	261.4292	225.7334	185.2647	130.1039	80.6995	57.3482 (83)	
Total gains	408.2811	465.2514	499.8447	545.0429	572.8354	566.6217	539.1376	506.8201	475.0344	431.6272	402.5037	391.7939 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
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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	50.6886	50.7770	50.8640	51.2767	51.3546	51.7207	51.7207	51.7890	51.5791	51.3546	51.1972	51.0336
alpha	4.3792	4.3851	4.3909	4.4184	4.4236	4.4480	4.4480	4.4526	4.4386	4.4236	4.4131	4.4022
util living area	0.9802	0.9645	0.9371	0.8649	0.7346	0.5536	0.4110	0.4538	0.6788	0.8907	0.9639	0.9832 (86)
MIT	19.7286	19.9487	20.2309	20.5900	20.8460	20.9659	20.9927	20.9888	20.9177	20.5932	20.1081	19.6877 (87)
Th 2	20.0449	20.0464	20.0479	20.0549	20.0562	20.0622	20.0622	20.0633	20.0599	20.0562	20.0535	20.0508 (88)
util rest of house	0.9756	0.9565	0.9228	0.8355	0.6827	0.4805	0.3257	0.3652	0.6060	0.8600	0.9543	0.9793 (89)
MIT 2	18.5800	18.8570	19.2082	19.6425	19.9239	20.0408	20.0593	20.0585	20.0015	19.6573	19.0659	18.5326 (90)
Living area fraction									FLA = Living area /	(4) =		0.4588 (91)
MIT	19.1069	19.3578	19.6774	20.0772	20.3469	20.4652	20.4875	20.4853	20.4218	20.0866	19.5440	19.0625 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1069	19.3578	19.6774	20.0772	20.3469	20.4652	20.4875	20.4853	20.4218	20.0866	19.5440	19.0625 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9698	0.9495	0.9163	0.8363	0.6995	0.5126	0.3648	0.4056	0.6353	0.8612	0.9480	0.9740 (94)
Useful gains	395.9547	441.7373	458.0225	455.8068	400.6780	290.4348	196.6532	205.5835	301.7780	371.7019	381.5748	381.5925 (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	769.9679	750.5021	682.8659	574.5529	443.8119	298.9064	198.1187	207.9224	323.0621	486.9101	640.6655	767.6323 (97)
Space heating kWh	278.2658	207.4899	167.2835	85.4972	32.0916	0.0000	0.0000	0.0000	0.0000	85.7149	186.5453	287.2136 (98a)
Space heating requirement - total per year (kWh/year)												1330.1018
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	278.2658	207.4899	167.2835	85.4972	32.0916	0.0000	0.0000	0.0000	0.0000	85.7149	186.5453	287.2136 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1330.1018
Space heating per m2										(98c) / (4) =		26.7626 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Fraction of main heating from main system 2												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
Efficiency of main space heating system 1 (in %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	278.2658	207.4899	167.2835	85.4972	32.0916	0.0000	0.0000	0.0000	0.0000	85.7149	186.5453	287.2136 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	278.2658	207.4899	167.2835	85.4972	32.0916	0.0000	0.0000	0.0000	0.0000	85.7149	186.5453	287.2136 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Space heating fuel used, main system 2												0.0000 (213)
Water heating												
Water heating requirement	179.3703	155.3883	159.5504	135.8155	124.7651	106.3129	100.2366	114.9338	120.8861	144.8831	160.2312	179.3922 (64)
Efficiency of water heater (217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100 (216)
Fuel for water heating, kWh/month	51.3352	44.4716	45.6628	38.8699	35.7074	30.4264	28.6874	32.8937	34.5972	41.4651	45.8577	51.3415 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	18.9190	15.1775	13.6657	10.0121	7.7336	6.3184	7.0549	9.1702	11.9111	15.6281	17.6519	19.4448 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-11.6456	-18.0304	-28.1034	-33.2834	-36.1765	-32.6191	-32.1966	-29.4504	-24.9370	-20.8559	-13.2269	-9.8925 (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)	0.4154	0.5994	0.4444	-1.2152	-4.1706	-6.2331	-6.1490	-5.1063	-3.6226	-0.4045	0.3374	0.3613 (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												1330.1018 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												349.4100
Water heating fuel used												481.3158 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												152.6873 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-315.1612 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)

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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	1648.9438 (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 (high-rate cost)	1330.1018	0.1635	217.4725 (261)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (261)
Space heating - main system 2 (high-rate cost)	0.0000	0.0000	0.0000 (262)
Space heating - main system 2 (low-rate cost)	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating - high rate cost	15.6533	0.1491	2.3345 (264)
Water heating - low rate cost	465.6625	0.1252	58.2888 (264)
Space and water heating			278.0958 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	152.6873	0.1490	22.7534 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-290.4178	0.1382	-40.1491
PV Unit electricity exported	-24.7433	0.1002	-2.4783
Total			-42.6273 (269)
Total CO2, kg/year			258.2219 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.2000 (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 (high-rate cost)	1330.1018	1.6095	2140.7930 (275)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (275)
Space heating - main system 2 (high-rate cost)	0.0000	0.0000	0.0000 (276)
Space heating - main system 2 (low-rate cost)	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating - high rate cost	15.6533	1.5574	24.3778 (278)
Water heating - low rate cost	465.6625	1.4484	674.4651 (278)
Space and water heating			2839.6359 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	152.6873	1.5547	237.3898 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-290.4178	1.5154	-440.1025
PV Unit electricity exported	-24.7433	0.3660	-9.0557
Total			-449.1582 (283)
Total Primary energy kWh/year			2627.8675 (286)
Dwelling Primary energy Rate (DPER)			52.8700 (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	49.7000 (1b)	2.4000 (2b)	119.2800 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	119.2800 (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) =	0.1677 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4177	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.3550 (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)

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Adj infilt rate	0.4527	0.4438	0.4349	0.3905	0.3816	0.3373	0.3373	0.3284	0.3550	0.3816	0.3994	0.4172 (22b)
Effective ac	0.6024	0.5985	0.5946	0.5763	0.5728	0.5569	0.5569	0.5539	0.5630	0.5728	0.5798	0.5870 (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 Semi-glazed door			1.9600	1.0000	1.9600			(26a)
TER Opening Type			7.8300	1.1450	8.9656			(27)
Heatloss Floor 1			49.7000	0.1300	6.4610			(28a)
External Wall 1			25.9700	0.1800	4.6746			(29a)
Total net area of external elements Aum(A, m2)	35.7600	9.7900	85.4600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	22.0612			(33)
Main dwelling								
Party Wall 1			36.9600	0.0000	0.0000			(32)

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

200.9252 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	5.7300	0.0500	0.2865	
E3 Sill	4.8000	0.0500	0.2400	
E4 Jamb	13.8000	0.0500	0.6900	
E5 Ground floor (normal)	14.9000	0.1600	2.3840	
E16 Corner (normal)	2.4000	0.0900	0.2160	
E18 Party wall between dwellings	4.8000	0.0600	0.2880	
P1 Party wall - Ground floor	15.4000	0.0800	1.2320	

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

5.3365 (36)

Point Thermal Bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 27.3977 (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	23.7138	23.5572	23.4037	22.6828	22.5479	21.9200	21.9200	21.8037	22.1618	22.5479	22.8207	23.1060	(38)
Average = Sum(39)m / 12 =	51.1115	50.9549	50.8014	50.0805	49.9456	49.3177	49.3177	49.2014	49.5596	49.9456	50.2185	50.5038	(39)
												50.0799	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0284	1.0253	1.0222	1.0077	1.0049	0.9923	0.9923	0.9900	0.9972	1.0049	1.0104	1.0162	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

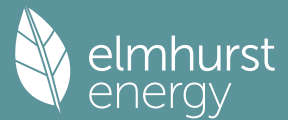
4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6813 (42)
Hot water usage for mixer showers												
52.4089	51.6213	50.4736	48.2777	46.6572	44.8500	43.8228	44.9618	46.2103	48.1507	50.3938	52.2081 (42a)	
Hot water usage for baths												
22.6608	22.3242	21.8503	20.9765	20.3221	19.5966	19.2047	19.6753	20.1877	20.9641	21.8559	22.5842 (42b)	
Hot water usage for other uses												
31.8479	30.6898	29.5317	28.3736	27.2155	26.0574	26.0574	27.2155	28.3736	29.5317	30.6898	31.8479 (42c)	
Average daily hot water use (litres/day)												98.2820 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
106.9176	104.6353	101.8556	97.6277	94.1948	90.5040	89.0849	91.8526	94.7717	98.6465	102.9395	106.6401 (44)	
Energy conte	169.3313	148.9993	156.5482	133.6475	126.8043	111.2852	107.7404	113.7327	116.8629	133.8623	146.6562	166.9727 (45)
Energy content (annual)												Total = Sum(45)m = 1632.4430
Distribution loss (46)m = 0.15 x (45)m												
25.3997	22.3499	23.4822	20.0471	19.0206	16.6928	16.1611	17.0599	17.5294	20.0794	21.9984	25.0459 (46)	
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)	
If cylinder contains dedicated solar storage												
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	
Total heat required for water heating calculated for each month												
215.9262	191.0850	203.1431	178.7393	173.3992	156.3770	154.3353	160.3276	161.9548	180.4572	191.7480	213.5676 (62)	
WWHRS	-23.9592	-21.1897	-22.1886	-18.3730	-17.1230	-14.6523	-13.7342	-14.6049	-15.1598	-17.8718	-20.2465	-23.5155 (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												
191.9670	169.8953	180.9545	160.3663	156.2762	141.7247	140.6011	145.7227	146.7950	162.5855	171.5015	190.0521 (64)	
12Total per year (kWh/year)												Total per year (kWh/year) = Sum(64)m = 1958.4420 (64)
Electric shower(s)												1958 (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)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												
Heat gains from water heating, kWh/month												
93.5786	83.2108	89.3282	80.5113	79.4384	73.0758	73.0996	75.0920	74.9304	81.7852	84.8366	92.7943 (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	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.3042	85.5868	77.3042	79.8810	77.3042	79.8810	77.3042	77.3042	79.8810	77.3042	79.8810	77.3042 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	146.4548	147.9745	144.1448	135.9919	125.7002	116.0275	109.5655	108.0457	111.8754	120.0284	130.3201	139.9928 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064 (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)												

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Water heating gains (Table 5)	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509 (71)
Total internal gains	125.7776	123.8256	120.0648	111.8212	106.7720	101.4942	98.2522	100.9302	104.0700	109.9263	117.8287	124.7236 (72)
	400.7557	408.6061	392.7329	378.9131	360.9954	345.6217	333.3409	334.4992	344.0455	358.4780	379.2489	393.2397 (73)

6. Solar gains

[Jan]	Area m2		Solar flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		FF Access factor Table 6d		Gains W	
North	5.4000		10.6334		0.6300		0.7000		0.7700		17.5484 (74)	
South	2.4300		46.7521		0.6300		0.7000		0.7700		34.7199 (78)	
Solar gains	52.2683	90.3982	129.4181	173.3980	208.6119	214.0979	203.4535	175.6737	144.1795	101.2514	62.8032	44.6304 (83)
Total gains	453.0241	499.0042	522.1511	552.3112	569.6074	559.7196	536.7944	510.1729	488.2250	459.7294	442.0520	437.8701 (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	54.2712	54.4380	54.6025	55.3885	55.5381	56.2452	56.2452	56.3781	55.9707	55.5381	55.2363	54.9243
alpha	4.6181	4.6292	4.6402	4.6926	4.7025	4.7497	4.7497	4.7585	4.7314	4.7025	4.6824	4.6616
util living area	0.9741	0.9582	0.9311	0.8603	0.7316	0.5471	0.4010	0.4384	0.6557	0.8709	0.9533	0.9773 (86)
MIT	19.9191	20.1022	20.3425	20.6554	20.8741	20.9751	20.9953	20.9930	20.9423	20.6863	20.2719	19.8945 (87)
Th 2	20.0597	20.0623	20.0649	20.0770	20.0792	20.0897	20.0897	20.0917	20.0857	20.0792	20.0746	19.8945 (88)
util rest of house	0.9681	0.9488	0.9155	0.8298	0.6795	0.4757	0.3196	0.3543	0.5837	0.8365	0.9412	0.9720 (89)
MIT 2	18.8252	19.0553	19.3537	19.7341	19.9728	20.0745	20.0880	20.0888	20.0461	19.7787	19.2792	18.8019 (90)
Living area fraction	19.3270	19.5355	19.8073	20.1567	20.3863	20.4876	20.5042	20.5036	20.4572	20.1951	19.7346	19.3031 (92)
Temperature adjustment	19.3270	19.5355	19.8073	20.1567	20.3863	20.4876	20.5042	20.5036	20.4572	20.1951	19.7346	19.3031 (93)
adjusted MIT	19.3270	19.5355	19.8073	20.1567	20.3863	20.4876	20.5042	20.5036	20.4572	20.1951	19.7346	19.3031 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9622	0.9425	0.9105	0.8327	0.6976	0.5075	0.3569	0.3928	0.6140	0.8413	0.9359	0.9665 (94)
Useful gains	435.9136	470.3105	475.4074	459.8922	397.3820	284.0322	191.5971	200.4135	299.7510	386.7790	413.7352	423.2076 (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	768.0548	745.7533	676.0310	563.7432	433.8404	290.3652	192.5475	201.9021	315.0621	479.2308	634.4910	762.7635 (97)
Space heating kWh	247.1130	185.0976	149.2639	74.7728	27.1250	0.0000	0.0000	0.0000	0.0000	68.7841	158.9442	252.6296 (98a)
Space heating requirement - total per year (kWh/year)												1163.7302
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	247.1130	185.0976	149.2639	74.7728	27.1250	0.0000	0.0000	0.0000	0.0000	68.7841	158.9442	252.6296 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1163.7302
Space heating per m2										(98c) / (4) =		23.4151 (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	247.1130	185.0976	149.2639	74.7728	27.1250	0.0000	0.0000	0.0000	0.0000	68.7841	158.9442	252.6296 (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)	267.7281	200.5391	161.7160	81.0106	29.3879	0.0000	0.0000	0.0000	0.0000	74.5223	172.2039	273.7049 (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	191.9670	169.8953	180.9545	160.3663	156.2762	141.7247	140.6011	145.7227	146.7950	162.5855	171.5015	190.0521 (64)
Efficiency of water heater (217)m	84.6272	84.2524	83.6314	82.4575	81.0144	79.8000	79.8000	79.8000	79.8000	82.2791	83.8896	84.6989 (217)
Fuel for water heating, kWh/month	226.8386	201.6505	216.3716	194.4835	192.8993	177.5999	176.1919	182.6099	183.9536	197.6023	204.4371	224.3856 (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	16.0623	12.8858	11.6022	8.5003	6.5659	5.3644	5.9896	7.7855	10.1126	13.2683	14.9865	16.5087 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-23.7136	-33.6724	-48.7652	-55.2905	-60.0607	-56.2761	-55.6371	-52.3390	-46.5376	-38.7698	-26.1773	-20.4783 (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)												

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(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	-12.6717	-26.7391	-53.2786	-80.1924	-106.1695	-106.6736	-105.3632	-89.1018	-65.2025	-38.2323	-16.9215	-10.0097	(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												1260.8127	(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												2379.0237	(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)												129.6319	(232)
Energy saving/generation technologies (Appendices M,N and Q)													
PV generation												-1228.2735	(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												2627.1947	(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	1260.8127	0.2100	264.7707	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2379.0237	0.2100	499.5950	(264)
Space and water heating			764.3656	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	129.6319	0.1443	18.7099	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-517.7176	0.1344	-69.5804	
PV Unit electricity exported	-710.5559	0.1258	-89.4204	
Total			-159.0008	(269)
Total CO2, kg/year			636.0040	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.8000	(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	1260.8127	1.1300	1424.7184	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2379.0237	1.1300	2688.2967	(278)
Space and water heating			4113.0151	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	129.6319	1.5338	198.8337	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-517.7176	1.4967	-774.8692	
PV Unit electricity exported	-710.5559	0.4619	-328.2336	
Total			-1103.1028	(283)
Total Primary energy kWh/year			3338.8468	(286)
Target Primary Energy Rate (TPER)			67.1800	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF FABRIC ENERGY EFFICIENCY

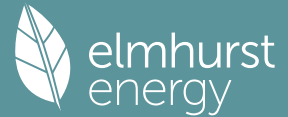
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling	49.7000	x	119.2800	(1b) - (3b)
Ground floor				(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.7000			
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	119.2800	(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)

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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) =
Pressure test
Pressure Test Method
Measured/design AP50
Infiltration rate
Number of sides sheltered

Air changes per hour
20.0000 / (5) = 0.1677 (8)
Yes
Blower Door
3.0000 (17)
0.3177 (18)
2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.2700 (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	0.3443	0.3375	0.3308	0.2970	0.2903	0.2565	0.2565	0.2498	0.2700	0.2903	0.3038	0.3173 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5593	0.5570	0.5547	0.5441	0.5421	0.5329	0.5329	0.5312	0.5365	0.5421	0.5461	0.5503 (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							
Ent Door			1.9600	1.2000	2.3520		(26a)
Windows			7.8300	1.1450	8.9656		(27)
Heatloss Floor 1			49.7000	0.1200	5.9640	75.0000	3727.5000 (28a)
External Wall 1	35.7600	9.7900	25.9700	0.2000	5.1940	60.0000	1558.2000 (29a)
Total net area of external elements Aum(A, m2)			85.4600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.4756		(33)
Main dwelling							
Party Wall 1			36.9600	0.0000	0.0000	70.0000	2587.2000 (32)
Party Ceiling 1			49.7000			30.0000	1491.0000 (32b)
Internal Wall 1			69.1200			9.0000	622.0800 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9985.9800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							200.9252 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.7300	0.0480	0.2750
E3 Sill	4.8000	0.0450	0.2160
E4 Jamb	13.8000	0.0510	0.7038
E5 Ground floor (normal)	14.9000	0.0640	0.9536
E16 Corner (normal)	2.4000	0.0570	0.1368
E18 Party wall between dwellings	4.8000	0.0620	0.2976
P1 Party wall - Ground floor	15.4000	0.3200	4.9280
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			7.5108 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	29.9865 (37)

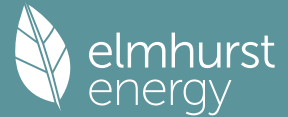
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	22.0140	21.9234	21.8346	21.4175	21.3395	20.9763	20.9763	20.9090	21.1162	21.3395	21.4974	21.6624 (38)
Heat transfer coeff	52.0004	51.9099	51.8211	51.4040	51.3260	50.9628	50.9628	50.8955	51.1027	51.3260	51.4838	51.6489 (39)
Average = Sum(39)m / 12 =												51.4037
HLP	1.0463	1.0445	1.0427	1.0343	1.0327	1.0254	1.0254	1.0241	1.0282	1.0327	1.0359	1.0392 (40)
HLP (average)												1.0343
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6813 (42)
Hot water usage for mixer showers												
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 (42a)
Hot water usage for baths												
22.1556	21.8212	21.3454	20.6328	19.9907	19.1067	18.4360	19.2561	19.6865	20.5624	21.4731	22.1380	(42b)
Hot water usage for other uses												
31.8479	30.6898	29.5317	28.3736	27.2155	26.0574	26.0574	27.2155	28.3736	29.5317	30.6898	31.8479	(42c)
Average daily hot water use (litres/day)												49.4961 (43)
Daily hot water use												
54.0035	52.5110	50.8770	49.0064	47.2062	45.1641	44.4934	46.4716	48.0601	50.0941	52.1629	53.9859	(44)
Energy conte	79.5025	69.4826	72.7023	64.0146	60.8299	52.2307	49.1665	54.6979	55.7473	64.5513	70.4999	79.2823 (45)
Energy content (annual)										Total = Sum(45)m =		772.7079
Distribution loss (46)m = 0.15 x (45)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:												
Total storage loss												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month												
67.5771	59.0602	61.7969	54.4124	51.7054	44.3961	41.7915	46.4932	47.3852	54.8686	59.9249	67.3900	(62)
WWHRS	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	(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												
67.5771	59.0602	61.7969	54.4124	51.7054	44.3961	41.7915	46.4932	47.3852	54.8686	59.9249	67.3900	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		656.8017 (64)
Electric shower(s)												657 (64)
41.9708	37.3963	40.8353	38.9687	39.6999	37.8698	39.1322	39.6999	38.9687	40.8353	40.0675	41.9708	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												477.4152 (64a)
Heat gains from water heating, kWh/month												

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27.3870 24.1141 25.6581 23.3453 22.8513 20.5665 20.2309 21.5483 21.5885 23.9260 24.9981 27.3402 (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	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.3042	85.5868	77.3042	79.8810	77.3042	79.8810	77.3042	77.3042	79.8810	77.3042	79.8810	77.3042	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	146.4548	147.9745	144.1448	135.9919	125.7002	116.0275	109.5655	108.0457	111.8754	120.0284	130.3201	139.9928	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	(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)	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	(71)
Water heating gains (Table 5)	36.8104	35.8841	34.4866	32.4240	30.7142	28.5646	27.1921	28.9627	29.9840	32.1586	34.7196	36.7476	(72)
Total internal gains	308.7885	317.6645	304.1548	296.5159	281.9376	272.6921	262.2809	262.5318	269.9595	277.7103	293.1398	302.2637	(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					5.4000	10.6334	0.5100	0.0000			0.7700			22.5490 (74)
South					2.4300	46.7521	0.5100	0.0000			0.7700			44.6137 (78)
Solar gains	67.1626	116.1579	166.2969	222.8092	268.0576	275.1069	261.4292	225.7334	185.2647	130.1039	80.6995			57.3482 (83)
Total gains	375.9512	433.8225	470.4517	519.3252	549.9953	547.7990	523.7101	488.2651	455.2242	407.8142	373.8392			359.6119 (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	53.3435	53.4365	53.5281	53.9624	54.0444	54.4296	54.4296	54.5015	54.2806	54.0444	53.8787	53.7066	
alpha	4.5562	4.5624	4.5685	4.5975	4.6030	4.6286	4.6286	4.6334	4.6187	4.6030	4.5919	4.5804	
util living area	0.9874	0.9752	0.9525	0.8867	0.7589	0.5723	0.4233	0.4711	0.7041	0.9122	0.9751	0.9896	(86)
MIT	19.7016	19.9219	20.2073	20.5771	20.8430	20.9668	20.9933	20.9892	20.9159	20.5763	20.0810	19.6613	(87)
Th 2	20.0449	20.0464	20.0479	20.0549	20.0562	20.0622	20.0622	20.0633	20.0599	20.0562	20.0535	20.0508	(88)
util rest of house	0.9842	0.9691	0.9406	0.8595	0.7071	0.4970	0.3355	0.3791	0.6304	0.8849	0.9679	0.9869	(89)
MIT 2	18.8731	19.0907	19.3696	19.7222	19.9514	20.0462	20.0602	20.0598	20.0138	19.7301	19.2551	18.8378	(90)
Living area fraction	19.2532	19.4720	19.7539	20.1144	20.3604	20.4685	20.4883	20.4862	20.4276	20.1183	19.6340	19.2155	(91)
MIT	19.2532	19.4720	19.7539	20.1144	20.3604	20.4685	20.4883	20.4862	20.4276	20.1183	19.6340	19.2155	(92)
Temperature adjustment	19.2532	19.4720	19.7539	20.1144	20.3604	20.4685	20.4883	20.4862	20.4276	20.1183	19.6340	19.2155	(93)
adjusted MIT	19.2532	19.4720	19.7539	20.1144	20.3604	20.4685	20.4883	20.4862	20.4276	20.1183	19.6340	19.2155	(93)

8. Space heating requirement

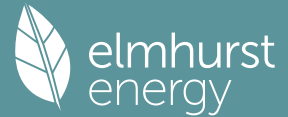
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9808	0.9646	0.9363	0.8614	0.7247	0.5304	0.3757	0.4212	0.6607	0.8869	0.9640	0.9839	(94)
Useful gains	368.7409	418.4849	440.5005	447.3351	398.5884	290.5470	196.7809	205.6612	300.7520	361.7093	360.3802	353.8250	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	777.5708	756.4315	686.8302	576.4648	444.5052	299.0767	198.1572	207.9685	323.3592	488.5358	645.2983	775.5361	(97)
Space heating kWh	304.1694	227.1001	183.2693	92.9734	34.1621	0.0000	0.0000	0.0000	0.0000	94.3589	205.1410	313.7531	(98a)
Space heating requirement - total per year (kWh/year)												1454.9274	
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	304.1694	227.1001	183.2693	92.9734	34.1621	0.0000	0.0000	0.0000	0.0000	94.3589	205.1410	313.7531	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1454.9274	
Space heating per m ²												29.2742	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	0.0000	0.0000	0.0000	0.0000	0.0000	479.0500	377.1245	386.8058	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9058	0.9488	0.9303	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	433.9440	357.8309	359.8317	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	610.4515	583.9922	543.9635	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	127.0854	168.2640	136.9941	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction												1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	31.7713	42.0660	34.2485	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												108.0859	(107)
Energy for space heating												29.2742	(99)
Energy for space cooling												2.1748	(108)
Total												31.4490	(109)
Fabric Energy Efficiency (DFEE)												31.4	(109)

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

1. Overall dwelling characteristics

Main dwelling	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	49.7000 (1b)	x 2.4000 (2b)	= 119.2800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 119.2800 (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	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) = 0.1677 (8)
Pressure Test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4177	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3550 (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	0.4527	0.4438	0.4349	0.3905	0.3816	0.3373	0.3373	0.3284	0.3550	0.3816	0.3994	0.4172 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.6024	0.5985	0.5946	0.5763	0.5728	0.5569	0.5569	0.5539	0.5630	0.5728	0.5798	0.5870 (25)

3. Heat losses and heat loss parameter

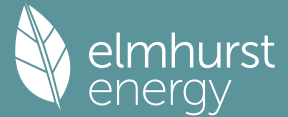
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
TER Semi-glazed door			1.9600	1.0000	1.9600		(26a)
TER Opening Type			7.8300	1.1450	8.9656		(27)
Heatloss Floor 1			49.7000	0.1300	6.4610		(28a)
External Wall 1	35.7600	9.7900	25.9700	0.1800	4.6746		(29a)
Total net area of external elements Aum(A, m ²)			85.4600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.0612		(33)
Main dwelling							
Party Wall 1			36.9600	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							200.9252 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				5.7300	0.0500	0.2865	
E3 Sill				4.8000	0.0500	0.2400	
E4 Jamb				13.8000	0.0500	0.6900	
E5 Ground floor (normal)				14.9000	0.1600	2.3840	
E16 Corner (normal)				2.4000	0.0900	0.2160	
E18 Party wall between dwellings				4.8000	0.0600	0.2880	
P1 Party wall - Ground floor				15.4000	0.0800	1.2320	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.3365 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	27.3977 (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	23.7138	23.5572	23.4037	22.6828	22.5479	21.9200	21.9200	21.8037	22.1618	22.5479	22.8207	23.1060 (38)
Average = Sum(39)m / 12 =	51.1115	50.9549	50.8014	50.0805	49.9456	49.3177	49.3177	49.2014	49.5596	49.9456	50.2185	50.5038 (39)
												50.0799

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0284	1.0253	1.0222	1.0077	1.0049	0.9923	0.9923	0.9900	0.9972	1.0049	1.0104	1.0162 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

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Assumed occupancy												1.6813 (42)
Hot water usage for mixer showers												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths												
22.6608	22.3242	21.8503	20.9765	20.3221	19.5966	19.2047	19.6753	20.1877	20.9641	21.8559	22.5842	(42b)
Hot water usage for other uses												
31.8479	30.6898	29.5317	28.3736	27.2155	26.0574	26.0574	27.2155	28.3736	29.5317	30.6898	31.8479	(42c)
Average daily hot water use (litres/day)												49.9627 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	54.5087	53.0140	51.3820	49.3501	47.5376	45.6540	45.2621	46.8908	48.5613	50.4958	52.5457	54.4321 (44)
Energy content (annual)	86.3284	75.4913	78.9722	67.5578	63.9948	56.1369	54.7406	58.0606	59.8810	68.5223	74.8610	85.2275 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		829.7742
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:												
Total storage loss												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month												
73.3791	64.1676	67.1264	57.4241	54.3956	47.7164	46.5295	49.3515	50.8988	58.2439	63.6318	72.4433 (62)	
WWHRS	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	(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	73.3791	64.1676	67.1264	57.4241	54.3956	47.7164	46.5295	49.3515	50.8988	58.2439	63.6318	72.4433 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		705.3081 (64)
Electric shower(s)	41.9708	37.3963	40.8353	38.9687	39.6999	37.8698	39.1322	39.6999	38.9687	40.8353	40.0675	41.9708 (64a)
												477.4152 (64a)
Heat gains from water heating, kWh/month												
28.8375	25.3910	26.9904	24.0982	23.5239	21.3966	21.4154	22.2629	22.4669	24.7698	25.9248	28.6035 (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	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.3042	85.5868	77.3042	79.8810	77.3042	79.8810	77.3042	77.3042	79.8810	77.3042	79.8810	77.3042 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	146.4548	147.9745	144.1448	135.9919	125.7002	116.0275	109.5655	108.0457	111.8754	120.0284	130.3201	139.9928 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064 (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)	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509 (71)
Water heating gains (Table 5)	38.7601	37.7842	36.2775	33.4697	31.6181	29.7174	28.7842	29.9232	31.2040	33.2928	36.0067	38.4456 (72)
Total internal gains	310.7381	319.5646	305.9456	297.5616	282.8416	273.8450	263.8729	263.4922	271.1795	278.8445	294.4269	303.9617 (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					5.4000	10.6334	0.6300	0.7000			0.7700	17.5484 (74)
South					2.4300	46.7521	0.6300	0.7000			0.7700	34.7199 (78)
Solar gains	52.2683	90.3982	129.4181	173.3980	208.6119	214.0979	203.4535	175.6737	144.1795	101.2514	62.8032	44.6304 (83)
Total gains	363.0065	409.9628	435.3637	470.9597	491.4535	487.9429	467.3264	439.1659	415.3590	380.0959	357.2301	348.5921 (84)

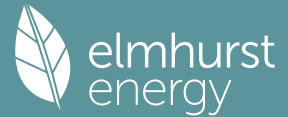
7. Mean internal temperature (heating season)

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	54.2712	54.4380	54.6025	55.3885	55.5381	56.2452	56.2452	56.3781	55.9707	55.5381	55.2363	54.9243
alpha	4.6181	4.6292	4.6402	4.6926	4.7025	4.7497	4.7497	4.7585	4.7314	4.7025	4.6824	4.6616
util living area	0.9888	0.9794	0.9624	0.9104	0.8006	0.6154	0.4578	0.5045	0.7370	0.9257	0.9783	0.9906 (86)
MIT	19.7032	19.9011	20.1661	20.5332	20.8128	20.9595	20.9919	20.9873	20.9054	20.5584	20.0825	19.6773 (87)
Th 2	20.0597	20.0623	20.0649	20.0770	20.0792	20.0897	20.0897	20.0917	20.0857	20.0792	20.0746	20.0699 (88)
util rest of house												
	0.9860	0.9743	0.9527	0.8873	0.7526	0.5393	0.3662	0.4099	0.6656	0.9017	0.9720	0.9882 (89)
MIT 2	18.8863	19.0833	19.3447	19.7033	19.9510	20.0697	20.0872	20.0875	20.0324	19.7347	19.2735	18.8685 (90)
Living area fraction									fLA = Living area / (4) =			0.4588 (91)
MIT	19.2610	19.4585	19.7215	20.0840	20.3464	20.4779	20.5022	20.5003	20.4329	20.1126	19.6447	19.2395 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2610	19.4585	19.7215	20.0840	20.3464	20.4779	20.5022	20.5003	20.4329	20.1126	19.6447	19.2395 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9829	0.9702	0.9485	0.8875	0.7675	0.5727	0.4082	0.4532	0.6943	0.9027	0.9683	0.9855 (94)
Useful gains	356.8019	397.7500	412.9359	417.9808	377.1786	279.4394	190.7652	199.0169	288.3701	343.1155	345.9218	343.5324 (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												

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Space heating kWh	764.6817	741.8250	671.6719	560.1022	431.8482	289.8829	192.4495	201.7398	313.8555	475.1116	629.9737	759.5520 (97)
Space heating requirement - total per year (kWh/year)	303.4625	231.2184	192.4995	102.3275	40.6742	0.0000	0.0000	0.0000	0.0000	98.2051	204.5173	309.5186 (98a)
Solar heating kWh												1482.4231
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	303.4625	231.2184	192.4995	102.3275	40.6742	0.0000	0.0000	0.0000	0.0000	98.2051	204.5173	309.5186 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1482.4231
Space heating per m2										(98c) / (4) =		29.8274 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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												
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	463.5865	364.9511	373.9309	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8828	0.9353	0.9152	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	409.2556	341.3432	342.2170	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	540.2952	517.8203	486.4126	0.0000	0.0000	0.0000	0.0000 (103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	94.3485	131.2990	107.2815	0.0000	0.0000	0.0000	0.0000 (104)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	23.5871	32.8247	26.8204	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												83.2322 (107)
Energy for space heating												29.8274 (99)
Energy for space cooling												1.6747 (108)
Total												31.5021 (109)
Fabric Energy Efficiency (TFEE)												31.5 (109)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	49.7000 (1b)	x 2.4000 (2b)	= 119.2800 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	119.2800 (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) = 0.1677 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.3177 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2700 (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	0.3443	0.3375	0.3308	0.2970	0.2903	0.2565	0.2565	0.2498	0.2700	0.2903	0.3038	0.3173 (22b)
Effective ac	0.5593	0.5570	0.5547	0.5441	0.5421	0.5329	0.5329	0.5312	0.5365	0.5421	0.5461	0.5503 (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							
Ent Door			1.9600	1.2000	2.3520		(26a)
Windows			7.8300	1.1450	8.9656		(27)
Heatloss Floor 1			49.7000	0.1200	5.9640	75.0000	3727.5000 (28a)
External Wall 1	35.7600	9.7900	25.9700	0.2000	5.1940	60.0000	1558.2000 (29a)
Total net area of external elements Aum(A, m2)			85.4600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	22.4756	(33)

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Main dwelling					
Party Wall 1	36.9600	0.0000	0.0000	70.0000	2587.2000 (32)
Party Ceiling 1	49.7000			30.0000	1491.0000 (32b)
Internal Wall 1	69.1200			9.0000	622.0800 (32c)

Heat capacity $C_m = \text{Sum}(A \times k)$ (28)...(30) + (32) + (32a)...(32e) = 9985.9800 (34)

Thermal mass parameter (TMP = C_m / TFA) in $\text{kJ/m}^2\text{K}$ 200.9252 (35)

List of Thermal Bridges					
K1 Element	Length	Psi-value	Total		
E2 Other lintels (including other steel lintels)	5.7300	0.0480	0.2750		
E3 Sill	4.8000	0.0450	0.2160		
E4 Jamb	13.8000	0.0510	0.7038		
E5 Ground floor (normal)	14.9000	0.0640	0.9536		
E16 Corner (normal)	2.4000	0.0570	0.1368		
E18 Party wall between dwellings	4.8000	0.0620	0.2976		
P1 Party wall - Ground floor	15.4000	0.3200	4.9280		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				7.5108	(36)
Point Thermal bridges				0.0000	
Total fabric heat loss				(33) + (36) + (36a) =	29.9865 (37)

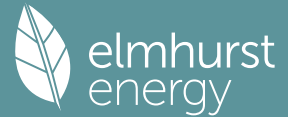
Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)\text{m} \times (5)$													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	22.0140	21.9234	21.8346	21.4175	21.3395	20.9763	20.9763	20.9090	21.1162	21.3395	21.4974	21.6624	(38)
Average = Sum(39)m / 12 =	52.0004	51.9099	51.8211	51.4040	51.3260	50.9628	50.9628	50.8955	51.1027	51.3260	51.4838	51.6489	(39)
	51.4037												
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0463	1.0445	1.0427	1.0343	1.0327	1.0254	1.0254	1.0241	1.0282	1.0327	1.0359	1.0392	(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													1.6813 (42)
Hot water usage for mixer showers													
Hot water usage for baths	51.0848	50.3027	49.1501	47.3770	45.7883	43.5658	41.8079	43.8630	44.8966	47.0979	49.3904	51.0387	(42a)
Hot water usage for other uses	22.1556	21.8212	21.3454	20.6328	19.9907	19.1067	18.4360	19.2561	19.6865	20.5624	21.4731	22.1380	(42b)
Average daily hot water use (litres/day)	31.8479	30.6898	29.5317	28.3736	27.2155	26.0574	26.0574	27.2155	28.3736	29.5317	30.6898	31.8479	(42c)
													96.5923 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	105.0883	102.8136	100.0271	96.3834	92.9945	88.7298	86.3013	90.3346	92.9567	97.1920	101.5532	105.0246	(44)
Energy content (annual)	154.7081	136.0432	142.9367	125.9008	119.8328	102.6131	95.3655	106.3254	107.8251	125.2417	137.2526	154.2364	(45)
Distribution loss (46)m = $0.15 \times (45)\text{m}$	23.2062	20.4065	21.4405	18.8851	17.9749	15.3920	14.3048	15.9488	16.1738	18.7863	20.5879	23.1355	(46)
Water storage loss:													
Store volume													201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6100 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	181.6595	160.3864	169.8881	151.9828	146.7842	128.6951	122.3169	133.2768	133.9071	152.1931	163.3346	181.1878	(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	-2.2892	-4.9981	-10.3377	-16.1673	-22.0191	-22.3822	-22.0802	-18.3431	-13.0210	-7.3100	-3.1034	-1.7956	(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	179.3703	155.3883	159.5504	135.8155	124.7651	106.3129	100.2366	114.9338	120.8861	144.8831	160.2312	179.3922	(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)
Heat gains from water heating, kWh/month	51.4404	45.2344	47.5265	41.8620	39.8444	34.1189	31.7090	35.3532	35.8518	41.6429	45.6365	51.2836	(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	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	21.6145	19.1978	15.6127	11.8198	8.8354	7.4593	8.0600	10.4767	14.0618	17.8547	20.8390	22.2152	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	218.5892	220.8575	215.1415	202.9729	187.6122	173.1753	163.5306	161.2623	166.9783	179.1469	194.5076	208.9445	(68)
Pumps, fans	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689	(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)
Water heating gains (Table 5)	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	(71)
Total internal gains	69.1404	67.3131	63.8796	58.1417	53.5543	47.3873	42.6197	47.5178	49.7942	55.9716	63.3840	68.9296	(72)
	389.7384	387.7627	375.0282	353.3287	330.3963	308.4162	294.6045	299.6511	311.2286	333.3675	359.1250	380.4836	(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								

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North	5.4000	10.6334	0.5100	0.0000	0.7700	22.5490 (74)
South	2.4300	46.7521	0.5100	0.0000	0.7700	44.6137 (78)

Solar gains	67.1626	116.1579	166.2969	222.8092	268.0576	275.1069	261.4292	225.7334	185.2647	130.1039	80.6995	57.3482 (83)
Total gains	456.9011	503.9206	541.3251	576.1380	598.4539	583.5231	556.0338	525.3844	496.4933	463.4713	439.8244	437.8319 (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	53.3435	53.4365	53.5281	53.9624	54.0444	54.4296	54.4296	54.5015	54.2806	54.0444	53.8787	53.7066
alpha	4.5562	4.5624	4.5685	4.5975	4.6030	4.6286	4.6286	4.6334	4.6187	4.6030	4.5919	4.5804
util living area	0.9739	0.9580	0.9255	0.8513	0.7182	0.5416	0.3997	0.4397	0.6606	0.8743	0.9559	0.9779 (86)
MIT	19.8942	20.0778	20.3455	20.6556	20.8756	20.9734	20.9947	20.9919	20.9354	20.6632	20.2273	19.8504 (87)
Th 2	20.0449	20.0464	20.0479	20.0549	20.0562	20.0622	20.0622	20.0633	20.0599	20.0562	20.0535	20.0508 (88)
util rest of house	0.9678	0.9485	0.9087	0.8194	0.6648	0.4688	0.3163	0.3530	0.5869	0.8399	0.9442	0.9727 (89)
MIT 2	18.7830	19.0130	19.3432	19.7144	19.9519	20.0460	20.0602	20.0600	20.0156	19.7333	19.2084	18.7325 (90)
Living area fraction									fLA = Living area / (4) =			0.4588 (91)
MIT	19.2928	19.5015	19.8030	20.1462	20.3757	20.4715	20.4889	20.4875	20.4376	20.1599	19.6758	19.2453 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2928	19.5015	19.8030	20.1462	20.3757	20.4715	20.4889	20.4875	20.4376	20.1599	19.6758	19.2453 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9618	0.9420	0.9038	0.8227	0.6837	0.5012	0.3545	0.3927	0.6176	0.8441	0.9386	0.9671 (94)
Useful gains	439.4300	474.6726	489.2521	474.0127	409.1662	292.4444	197.1106	206.3078	306.6532	391.2245	412.8263	423.4385 (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	779.6307	757.9594	689.3767	578.0996	445.2865	299.2268	198.1902	208.0350	323.8659	490.6698	647.4531	777.0736 (97)
Space heating kWh	253.1093	190.3688	148.8927	74.9426	26.8735	0.0000	0.0000	0.0000	0.0000	73.9873	168.9313	263.1045 (98a)
Space heating requirement - total per year (kWh/year)												1200.2100
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	253.1093	190.3688	148.8927	74.9426	26.8735	0.0000	0.0000	0.0000	0.0000	73.9873	168.9313	263.1045 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1200.2100
Space heating per m2										(98c) / (4) =		24.1491 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Fraction of main heating from main system 2												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
Efficiency of main space heating system 1 (in %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	253.1093	190.3688	148.8927	74.9426	26.8735	0.0000	0.0000	0.0000	0.0000	73.9873	168.9313	263.1045 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	253.1093	190.3688	148.8927	74.9426	26.8735	0.0000	0.0000	0.0000	0.0000	73.9873	168.9313	263.1045 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Water heating												
Water heating requirement	179.3703	155.3883	159.5504	135.8155	124.7651	106.3129	100.2366	114.9338	120.8861	144.8831	160.2312	179.3922 (64)
Efficiency of water heater (217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100 (216)
Fuel for water heating, kWh/month	51.3352	44.4716	45.6628	38.8699	35.7074	30.4264	28.6874	32.8937	34.5972	41.4651	45.8577	51.3415 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	18.9190	15.1775	13.6657	10.0121	7.7336	6.3184	7.0549	9.1702	11.9111	15.6281	17.6519	19.4448 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-11.5909	-17.9282	-27.8503	-32.9585	-35.8853	-32.6191	-32.1966	-29.4504	-24.9370	-20.6802	-13.1548	-9.8522 (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	0.3606	0.4972	0.1914	-1.5402	-4.4619	-6.2331	-6.1490	-5.1063	-3.6226	-0.5802	0.2653	0.3210 (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												1200.2100 (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	349.4100
Water heating fuel used	481.3158 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	152.6873 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-315.1612 (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	1519.0521 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1 (high-rate cost)	1200.2100	19.6000	235.2412 (240)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (240)
Space heating - main system 2 (1.00*19.60 + 0.00*9.40)	0.0000	19.6000	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (electric off-peak tariff)			
High-rate fraction			0.0325 (243)
Low-rate fraction			0.9675 (244)
High-rate cost	15.6533	19.6000	3.0681 (245)
Low-rate cost	465.6625	9.4000	43.7723 (246)
Energy for instantaneous electric shower(s)	0.0000	18.5800	0.0000 (247a)
Pumps, fans and electric keep-hot (0.90*19.60 + 0.10*9.40)	0.0000	0.0000	0.0000 (249)
Energy for lighting (0.90*19.60 + 0.10*9.40)	152.6873	18.5800	28.3693 (250)
Additional standing charges			7.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-289.1035	18.5800	-53.7154
PV Unit electricity exported	-26.0577	5.5900	-1.4566
Total			-55.1721 (252)
Total energy cost			262.2788 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.9970 (257)
SAP value		83.8379
SAP rating (Section 12)		84 (258)
SAP band		B

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

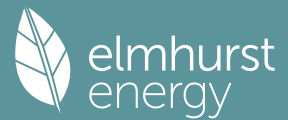
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1 (high-rate cost)	1200.2100	0.1637	196.4475 (261)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (261)
Space heating - main system 2 (high-rate cost)	0.0000	0.0000	0.0000 (262)
Space heating - main system 2 (low-rate cost)	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating - high rate cost	15.6533	0.1491	2.3345 (264)
Water heating - low rate cost	465.6625	0.1252	58.2888 (264)
Space and water heating			257.0708 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	152.6873	0.1490	22.7534 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-289.1035	0.1382	-39.9526
PV Unit electricity exported	-26.0577	0.1030	-2.6844
Total			-42.6370 (269)
Total CO2, kg/year			237.1872 (272)
CO2 emissions per m2			4.7700 (273)
EI value			96.6438
EI rating			97 (274)
EI band			A

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	49.7000 (1b)	x 2.4000 (2b)	= 119.2800 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.7000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	119.2800 (5)

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2. Ventilation rate

												m3 per hour
Number of open chimneys												0 * 80 = 0.0000 (6a)
Number of open flues												0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire												0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler												0 * 20 = 0.0000 (6d)
Number of flues attached to other heater												0 * 35 = 0.0000 (6e)
Number of blocked chimneys												0 * 20 = 0.0000 (6f)
Number of intermittent extract fans												2 * 10 = 20.0000 (7a)
Number of passive vents												0 * 10 = 0.0000 (7b)
Number of flueless gas fires												0 * 40 = 0.0000 (7c)
												Air changes per hour
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											20.0000 / (5) = 0.1677 (8)
Pressure test												Yes
Pressure Test Method												Blower Door
Measured/design AP50												3.0000 (17)
Infiltration rate												0.3177 (18)
Number of sides sheltered												2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =											0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =											0.2700 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	3.8000	3.5000	3.7000	3.4000	3.5000	3.0000	3.1000	3.0000	3.0000	3.2000	3.1000	3.5000 (22)
Adj infilt rate	0.9500	0.8750	0.9250	0.8500	0.8750	0.7500	0.7750	0.7500	0.7500	0.8000	0.7750	0.8750 (22a)
Effective ac	0.2565	0.2363	0.2498	0.2295	0.2363	0.2025	0.2093	0.2025	0.2025	0.2160	0.2093	0.2363 (22b)
	0.5329	0.5279	0.5312	0.5263	0.5279	0.5205	0.5219	0.5205	0.5205	0.5233	0.5219	0.5279 (25)

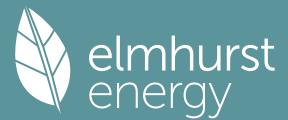
3. Heat losses and heat loss parameter

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													
Ent Door			1.9600	1.2000	2.3520			(26a)					
Windows			7.8300	1.1450	8.9656			(27)					
Heatloss Floor 1			49.7000	0.1200	5.9640	75.0000	3727.5000	(28a)					
External Wall 1	35.7600	9.7900	25.9700	0.2000	5.1940	60.0000	1558.2000	(29a)					
Total net area of external elements Aum(A, m2)			85.4600					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.4756			(33)					
Main dwelling													
Party Wall 1			36.9600	0.0000	0.0000	70.0000	2587.2000	(32)					
Party Ceiling 1			49.7000			30.0000	1491.0000	(32b)					
Internal Wall 1			69.1200			9.0000	622.0800	(32c)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9985.9800	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							200.9252	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value		Total						
E2 Other lintels (including other steel lintels)				5.7300	0.0480		0.2750						
E3 Sill				4.8000	0.0450		0.2160						
E4 Jamb				13.8000	0.0510		0.7038						
E5 Ground floor (normal)				14.9000	0.0640		0.9536						
E16 Corner (normal)				2.4000	0.0570		0.1368						
E18 Party wall between dwellings				4.8000	0.0620		0.2976						
P1 Party wall - Ground floor				15.4000	0.3200		4.9280						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.5108	(36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	29.9865	(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	20.9763	20.7799	20.9090	20.7180	20.7799	20.4884	20.5431	20.4884	20.4884	20.5996	20.5431	20.7799	(38)
Average = Sum(39)m / 12 =	50.9628	50.7664	50.8955	50.7045	50.7664	50.4749	50.5296	50.4749	50.4749	50.5861	50.5296	50.7664	(39)
												50.6610	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0254	1.0215	1.0241	1.0202	1.0215	1.0156	1.0167	1.0156	1.0156	1.0178	1.0167	1.0215	(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													1.6813 (42)
Hot water usage for mixer showers													
	51.0848	50.3027	49.1501	47.3770	45.7883	43.5658	41.8079	43.8630	44.8966	47.0979	49.3904	51.0387	(42a)
Hot water usage for baths													
	22.1556	21.8212	21.3454	20.6328	19.9907	19.1067	18.4360	19.2561	19.6865	20.5624	21.4731	22.1380	(42b)
Hot water usage for other uses													
	31.8479	30.6898	29.5317	28.3736	27.2155	26.0574	26.0574	27.2155	28.3736	29.5317	30.6898	31.8479	(42c)
Average daily hot water use (litres/day)													96.5923 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	105.0883	102.8136	100.0271	96.3834	92.9945	88.7298	86.3013	90.3346	92.9567	97.1920	101.5532	105.0246	(44)
Energy content (annual)	154.7081	136.0432	142.9367	125.9008	119.8328	102.6131	95.3655	106.3254	107.8251	125.2417	137.2526	154.2364	(45)
Distribution loss (46)m = 0.15 x (45)m													
	23.2062	20.4065	21.4405	18.8851	17.9749	15.3920	14.3048	15.9488	16.1738	18.7863	20.5879	23.1355	(46)
Water storage loss:													
Store volume													201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6100 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8694 (55)
Total storage loss													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)

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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	181.6595	160.3864	169.8881	151.9828	146.7842	128.6951	122.3169	133.2768	133.9071	152.1931	163.3346	181.1878 (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	-2.9569	-5.3161	-10.8924	-17.4104	-22.7393	-24.9701	-24.4489	-21.0058	-14.8264	-8.5887	-3.9177	-2.3397 (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	178.7026	155.0703	158.9957	134.5724	124.0449	103.7250	97.8680	112.2710	119.0807	143.6044	159.4169	178.8481 (64)
	Total per year (kWh/year) = Sum(64)m =											1666.2001 (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	51.4404	45.2344	47.5265	41.8620	39.8444	34.1189	31.7090	35.3532	35.8518	41.6429	45.6365	51.2836 (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	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.6145	19.1978	15.6127	11.8198	8.8354	7.4593	8.0600	10.4767	14.0618	17.8547	20.8390	22.2152	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	218.5892	220.8575	215.1415	202.9729	187.6122	173.1753	163.5306	161.2623	166.9783	179.1469	194.5076	208.9445	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689	(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)	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	(71)
Water heating gains (Table 5)	69.1404	67.3131	63.8796	58.1417	53.5543	47.3873	42.6197	47.5178	49.7942	55.9716	63.3840	68.9296	(72)
Total internal gains	389.7384	387.7627	375.0282	353.3287	330.3963	308.4162	294.6045	299.6511	311.2286	333.3675	359.1250	380.4836	(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				5.4000	12.7650	0.5100	0.0000	0.7700	27.0693 (74)			
South				2.4300	54.2217	0.5100	0.0000	0.7700	51.7417 (78)			
Solar gains	78.8110	119.4621	171.0342	234.9149	275.6379	299.9299	283.2883	249.7302	202.3471	143.9472	93.3477	67.6488 (83)
Total gains	468.5494	507.2247	546.0624	588.2436	606.0342	608.3461	577.8928	549.3812	513.5757	477.3147	452.4726	448.1324 (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	54.4296	54.6402	54.5015	54.7069	54.6402	54.9557	54.8962	54.9557	54.9557	54.8349	54.8962	54.6402	
alpha	4.6286	4.6427	4.6334	4.6471	4.6427	4.6637	4.6597	4.6637	4.6637	4.6557	4.6597	4.6427	
util living area	0.9657	0.9495	0.9045	0.8081	0.6503	0.4344	0.2966	0.3205	0.5842	0.8302	0.9407	0.9713	(86)
MIT	20.0479	20.1984	20.4797	20.7570	20.9284	20.9914	20.9989	20.9984	20.9660	20.7652	20.3656	19.9967	(87)
Th 2	20.0622	20.0655	20.0633	20.0665	20.0655	20.0704	20.0694	20.0704	20.0704	20.0685	20.0694	20.0655	(88)
util rest of house	0.9577	0.9380	0.8832	0.7692	0.5901	0.3606	0.2158	0.2359	0.5061	0.7866	0.9251	0.9644	(89)
MIT 2	18.9887	19.1772	19.5171	19.8371	20.0106	20.0662	20.0692	20.0700	20.0497	19.8559	19.3902	18.9276	(90)
Living area fraction									fLA = Living area / (4) =			0.4588	(91)
MIT	19.4746	19.6457	19.9587	20.2591	20.4317	20.4906	20.4957	20.4959	20.4701	20.2730	19.8377	19.4181	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4746	19.6457	19.9587	20.2591	20.4317	20.4906	20.4957	20.4959	20.4701	20.2730	19.8377	19.4181	(93)

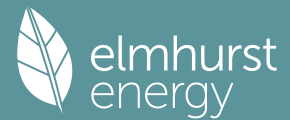
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	445.8691	472.7233	480.8472	457.5242	372.3656	239.8233	146.1364	150.9498	277.5947	380.4060	416.5479	429.5750	(94)
Ext temp.	5.0000	5.5000	7.4000	9.8000	12.7000	15.7000	17.6000	17.5000	14.8000	11.4000	7.8000	4.9000	(96)
Heat loss rate W	737.6670	718.1237	639.1824	530.3234	392.5083	241.8053	146.3179	151.2172	286.1975	448.8512	608.2576	737.0303	(97)
Space heating kWh	217.0977	164.9091	117.8014	52.4154	14.9862	0.0000	0.0000	0.0000	0.0000	50.9232	138.0310	228.7468	(98a)
Space heating requirement - total per year (kWh/year)												984.9108	
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	217.0977	164.9091	117.8014	52.4154	14.9862	0.0000	0.0000	0.0000	0.0000	50.9232	138.0310	228.7468	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												984.9108	
Space heating per m2										(98c) / (4) =		19.8171	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)

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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	217.0977	164.9091	117.8014	52.4154	14.9862	0.0000	0.0000	0.0000	0.0000	50.9232	138.0310	228.7468	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	217.0977	164.9091	117.8014	52.4154	14.9862	0.0000	0.0000	0.0000	0.0000	50.9232	138.0310	228.7468	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating requirement													
Water heating requirement	178.7026	155.0703	158.9957	134.5724	124.0449	103.7250	97.8680	112.2710	119.0807	143.6044	159.4169	178.8481	(64)
Efficiency of water heater													349.4100 (216)
(217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(217)
Fuel for water heating, kWh/month	51.1441	44.3806	45.5041	38.5142	35.5012	29.6858	28.0095	32.1316	34.0805	41.0991	45.6246	51.1857	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	18.9190	15.1775	13.6657	10.0121	7.7336	6.3184	7.0549	9.1702	11.9111	15.6281	17.6519	19.4448	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-13.5031	-18.4434	-28.2229	-33.5193	-35.7579	-34.3752	-33.8093	-31.4846	-26.6682	-22.2601	-15.0130	-11.5653	(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	0.3437	0.3480	-0.3065	-2.4914	-5.3362	-6.9555	-6.8102	-5.8491	-4.1257	-1.1450	0.1451	0.3278	(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												984.9108	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												349.4100	
Water heating fuel used												476.8610	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												152.6873	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-336.4773	(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												1277.9818	(238)

10a. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1 (high-rate cost)	984.9108	34.6000	340.7791
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000
Space heating - main system 2 (1.00*34.60 + 0.00*15.80)	0.0000	34.6000	0.0000
Total CO2 associated with community systems			0.0000
Water heating (electric off-peak tariff)			0.0325
High-rate fraction			0.9675
Low-rate fraction			5.3659
High-rate cost	15.5084	34.6000	72.8937
Low-rate cost	461.3526	15.8000	0.0000
Energy for instantaneous electric shower(s)	0.0000	32.7200	0.0000
Pumps, fans and electric keep-hot (0.90*34.60 + 0.10*15.80)	0.0000	0.0000	0.0000
Energy for lighting (0.90*34.60 + 0.10*15.80)	152.6873	32.7200	49.9593
Additional standing charges			8.0000
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-304.6223	32.7200	-99.6724
PV Unit electricity exported	-31.8549	5.8100	-1.8508
Total			-101.5232
Total energy cost			375.4748

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 (high-rate cost)	984.9108	0.1644	161.9315
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000
Space heating - main system 2 (high-rate cost)	0.0000	0.0000	0.0000
Space heating - main system 2 (low-rate cost)	0.0000	0.0000	0.0000
Total CO2 associated with community systems			0.0000
Water heating - high rate cost	15.5084	0.1493	2.3151
Water heating - low rate cost	461.3526	0.1253	57.8025
Space and water heating			222.0490
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000
Energy for lighting	152.6873	0.1490	22.7534

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Energy saving/generation technologies			
PV Unit electricity used in dwelling	-304.6223	0.1383	-42.1392
PV Unit electricity exported	-31.8549	0.1074	-3.4202
Total			-45.5595 (269)
Total CO ₂ , kg/year			199.2430 (272)

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

	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1 (high-rate cost)	984.9108	1.6128	1588.4340 (275)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (275)
Space heating - main system 2 (high-rate cost)	0.0000	0.0000	0.0000 (276)
Space heating - main system 2 (low-rate cost)	0.0000	0.0000	0.0000 (276)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating - high rate cost	15.5084	1.5579	24.1599 (278)
Water heating - low rate cost	461.3526	1.4489	668.4363 (278)
Space and water heating			2281.0302 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	152.6873	1.5547	237.3898 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-304.6223	1.5157	-461.7198
PV Unit electricity exported	-31.8549	0.3931	-12.5236
Total			-474.2434 (283)
Total Primary energy kWh/year			2044.1766 (286)

SAP 10 EPC IMPROVEMENTS

Grd Flr Flat edle

Current energy efficiency rating:	B 84
Current environmental impact rating:	A 97

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures: (none)	SAP change	Cost change	CO ₂ change
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Recommended measures (none)	Typical annual savings	Energy efficiency	Environmental impact
	Total Savings	£0	0.00 kg/m ²

Potential energy efficiency rating:	B 84
Potential environmental impact rating:	A 97

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, South East England):

	Current £477	Potential £477	Saving £0
Electricity			
Space heating	£349	£349	£0
Water heating	£78	£78	£0
Lighting	£50	£50	£0
Generated (PV)	-£102	-£102	£0
Total cost of fuels	£375	£375	£0
Total cost of uses	£375	£375	£0
Delivered energy	26 kWh/m ²	26 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO ₂ emissions per m ²	4 kg/m ²	4 kg/m ²	0 kg/m ²
Primary energy	41 kWh/m ²	41 kWh/m ²	0 kWh/m ²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

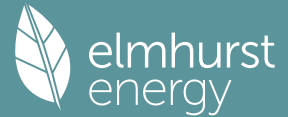
1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	49.7000 (1b)	x 2.4000 (2b)	= 119.2800 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 119.2800 (5)

2. Ventilation rate

m³ per hour

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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) = 0.1677 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 3.0000 (17)
Infiltration rate 0.3177 (18)
Number of sides sheltered 2 (19)
Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.2700 (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	0.3443	0.3375	0.3308	0.2970	0.2903	0.2565	0.2565	0.2498	0.2700	0.2903	0.3038	0.3173 (22b)
Effective ac	0.5593	0.5570	0.5547	0.5441	0.5421	0.5329	0.5329	0.5312	0.5365	0.5421	0.5461	0.5503 (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							
Ent Door			1.9600	1.2000	2.3520		(26a)
Windows			7.8300	1.1450	8.9656		(27)
Heatloss Floor 1			49.7000	0.1200	5.9640	75.0000	3727.5000 (28a)
External Wall 1	35.7600	9.7900	25.9700	0.2000	5.1940	60.0000	1558.2000 (29a)
Total net area of external elements Aum(A, m2)			85.4600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.4756		(33)
Main dwelling							
Party Wall 1			36.9600	0.0000	0.0000	70.0000	2587.2000 (32)
Party Ceiling 1			49.7000			30.0000	1491.0000 (32b)
Internal Wall 1			69.1200			9.0000	622.0800 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9985.9800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 200.9252 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.7300	0.0480	0.2750
E3 Sill	4.8000	0.0450	0.2160
E4 Jamb	13.8000	0.0510	0.7038
E5 Ground floor (normal)	14.9000	0.0640	0.9536
E16 Corner (normal)	2.4000	0.0570	0.1368
E18 Party wall between dwellings	4.8000	0.0620	0.2976
P1 Party wall - Ground floor	15.4000	0.3200	4.9280

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.5108 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 29.9865 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
(38)m Jan 22.0140 Feb 21.9234 Mar 21.8346 Apr 21.4175 May 21.3395 Jun 20.9763 Jul 20.9763 Aug 20.9090 Sep 21.1162 Oct 21.3395 Nov 21.4974 Dec 21.6624 (38)
Heat transfer coeff 22.0004 51.9099 51.8211 51.4040 51.3260 50.9628 50.9628 50.8955 51.1027 51.3260 51.4838 51.6489 (39)
Average = Sum(39)m / 12 = 51.4037

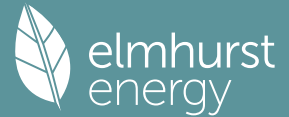
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0463	1.0445	1.0427	1.0343	1.0327	1.0254	1.0254	1.0241	1.0282	1.0327	1.0359	1.0392 (40)
HLP (average)												1.0343
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.6813 (42)
Hot water usage for mixer showers 51.0848 50.3027 49.1501 47.3770 45.7883 43.5658 41.8079 43.8630 44.8966 47.0979 49.3904 51.0387 (42a)
Hot water usage for baths 22.1556 21.8212 21.3454 20.6328 19.9907 19.1067 18.4360 19.2561 19.6865 20.5624 21.4731 22.1380 (42b)
Hot water usage for other uses 31.8479 30.6898 29.5317 28.3736 27.2155 26.0574 26.0574 27.2155 28.3736 29.5317 30.6898 31.8479 (42c)
Average daily hot water use (litres/day) 96.5923 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	105.0883	102.8136	100.0271	96.3834	92.9945	88.7298	86.3013	90.3346	92.9567	97.1920	101.5532	105.0246 (44)
Energy conte	154.7081	136.0432	142.9367	125.9008	119.8328	102.6131	95.3655	106.3254	107.8251	125.2417	137.2526	154.2364 (45)
Energy content (annual)										Total = Sum(45)m =		1508.2814
Distribution loss (46)m = 0.15 x (45)m	23.2062	20.4065	21.4405	18.8851	17.9749	15.3920	14.3048	15.9488	16.1738	18.7863	20.5879	23.1355 (46)
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	181.6595	160.3864	169.8881	151.9828	146.7842	128.6951	122.3169	133.2768	133.9071	152.1931	163.3346	181.1878 (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)

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PV diverter	-2.2892	-4.9981	-10.3377	-16.1673	-22.0191	-22.3822	-22.0802	-18.3431	-13.0210	-7.3100	-3.1034	-1.7956 (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	179.3703	155.3883	159.5504	135.8155	124.7651	106.3129	100.2366	114.9338	120.8861	144.8831	160.2312	179.3922 (64)
Total per year (kWh/year) = Sum(64)m =												1681.7657 (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	51.4404	45.2344	47.5265	41.8620	39.8444	34.1189	31.7090	35.3532	35.8518	41.6429	45.6365	51.2836 (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	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.6145	19.1978	15.6127	11.8198	8.8354	7.4593	8.0600	10.4767	14.0618	17.8547	20.8390	22.2152	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	218.5892	220.8575	215.1415	202.9729	187.6122	173.1753	163.5306	161.2623	166.9783	179.1469	194.5076	208.9445	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689	(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)	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	(71)
Water heating gains (Table 5)	69.1404	67.3131	63.8796	58.1417	53.5543	47.3873	42.6197	47.5178	49.7942	55.9716	63.3840	68.9296	(72)
Total internal gains	389.7384	387.7627	375.0282	353.3287	330.3963	308.4162	294.6045	299.6511	311.2286	333.3675	359.1250	380.4836	(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					5.4000	10.6334	0.5100	0.0000			0.7700	22.5490 (74)
South					2.4300	46.7521	0.5100	0.0000			0.7700	44.6137 (78)
Solar gains	67.1626	116.1579	166.2969	222.8092	268.0576	275.1069	261.4292	225.7334	185.2647	130.1039	80.6995	57.3482 (83)
Total gains	456.9011	503.9206	541.3251	576.1380	598.4539	583.5231	556.0338	525.3844	496.4933	463.4713	439.8244	437.8319 (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	53.3435	53.4365	53.5281	53.9624	54.0444	54.4296	54.4296	54.5015	54.2806	54.0444	53.8787	53.7066	
alpha	4.5562	4.5624	4.5685	4.5975	4.6030	4.6286	4.6286	4.6334	4.6187	4.6030	4.5919	4.5804	
util living area	0.9739	0.9580	0.9255	0.8513	0.7182	0.5416	0.3997	0.4397	0.6606	0.8743	0.9559	0.9779	(86)
MIT	19.8942	20.0778	20.3455	20.6556	20.8756	20.9734	20.9947	20.9919	20.9354	20.6632	20.2273	19.8504	(87)
Th 2	20.0449	20.0464	20.0479	20.0549	20.0562	20.0622	20.0622	20.0633	20.0599	20.0562	20.0535	20.0508	(88)
util rest of house	0.9678	0.9485	0.9087	0.8194	0.6648	0.4688	0.3163	0.3530	0.5869	0.8399	0.9442	0.9727	(89)
MIT 2	18.7830	19.0130	19.3432	19.7144	19.9519	20.0460	20.0602	20.0600	20.0156	19.7333	19.2084	18.7325	(90)
Living area fraction	fLA = Living area / (4) =												0.4588 (91)
MIT	19.2928	19.5015	19.8030	20.1462	20.3757	20.4715	20.4889	20.4875	20.4376	20.1599	19.6758	19.2453	(92)
Temperature adjustment													0.0000
adjusted MIT	19.2928	19.5015	19.8030	20.1462	20.3757	20.4715	20.4889	20.4875	20.4376	20.1599	19.6758	19.2453	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	439.4300	474.6726	489.2521	474.0127	409.1662	292.4444	197.1106	206.3078	306.6532	391.2245	412.8263	423.4385	(94)
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	(95)
Heat loss rate W	779.6307	757.9594	689.3767	578.0996	445.2865	299.2268	198.1902	208.0350	323.8659	490.6698	647.4531	777.0736	(96)
Space heating kWh	253.1093	190.3688	148.8927	74.9426	26.8735	0.0000	0.0000	0.0000	0.0000	73.9873	168.9313	263.1045	(98a)
Space heating requirement - total per year (kWh/year)													1200.2100
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	253.1093	190.3688	148.8927	74.9426	26.8735	0.0000	0.0000	0.0000	0.0000	73.9873	168.9313	263.1045	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)													1200.2100
Space heating per m2													(98c) / (4) = 24.1491 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Fraction of main heating from main system 2												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
Efficiency of main space heating system 1 (in %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

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Space heating requirement	253.1093	190.3688	148.8927	74.9426	26.8735	0.0000	0.0000	0.0000	0.0000	73.9873	168.9313	263.1045	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	253.1093	190.3688	148.8927	74.9426	26.8735	0.0000	0.0000	0.0000	0.0000	73.9873	168.9313	263.1045	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating requirement	179.3703	155.3883	159.5504	135.8155	124.7651	106.3129	100.2366	114.9338	120.8861	144.8831	160.2312	179.3922	(64)
Efficiency of water heater (217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(216)
Fuel for water heating, kWh/month	51.3352	44.4716	45.6628	38.8699	35.7074	30.4264	28.6874	32.8937	34.5972	41.4651	45.8577	51.3415	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	18.9190	15.1775	13.6657	10.0121	7.7336	6.3184	7.0549	9.1702	11.9111	15.6281	17.6519	19.4448	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-11.5909	-17.9282	-27.8503	-32.9585	-35.8853	-32.6191	-32.1966	-29.4504	-24.9370	-20.6802	-13.1548	-9.8522	(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)	0.3606	0.4972	0.1914	-1.5402	-4.4619	-6.2331	-6.1490	-5.1063	-3.6226	-0.5802	0.2653	0.3210	(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												1200.2100	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												349.4100	
Water heating fuel used												481.3158	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												152.6873	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-315.1612	(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												1519.0521	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1 (high-rate cost)	1200.2100	19.6000	235.2412 (240)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (240)
Space heating - main system 2 (1.00*19.60 + 0.00*9.40)	0.0000	19.6000	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (electric off-peak tariff)			
High-rate fraction			0.0325 (243)
Low-rate fraction			0.9675 (244)
High-rate cost	15.6533	19.6000	3.0681 (245)
Low-rate cost	465.6625	9.4000	43.7723 (246)
Energy for instantaneous electric shower(s)	0.0000	18.5800	0.0000 (247a)
Pumps, fans and electric keep-hot (0.90*19.60 + 0.10*9.40)	0.0000	0.0000	0.0000 (249)
Energy for lighting (0.90*19.60 + 0.10*9.40)	152.6873	18.5800	28.3693 (250)
Additional standing charges			7.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-289.1035	18.5800	-53.7154
PV Unit electricity exported	-26.0577	5.5900	-1.4566
Total			-55.1721 (252)
Total energy cost			262.2788 (255)

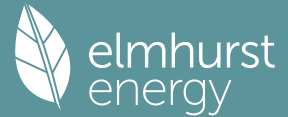
11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9970 (257)
SAP value		83.8379
SAP rating (Section 12)		84 (258)
SAP band		B

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 (high-rate cost)	1200.2100	0.1637	196.4475 (261)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (261)
Space heating - main system 2 (high-rate cost)	0.0000	0.0000	0.0000 (262)

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Space heating - main system 2 (low-rate cost)	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating - high rate cost	15.6533	0.1491	2.3345 (264)
Water heating - low rate cost	465.6625	0.1252	58.2888 (264)
Space and water heating			257.0708 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	152.6873	0.1490	22.7534 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-289.1035	0.1382	-39.9526
PV Unit electricity exported	-26.0577	0.1030	-2.6844
Total			-42.6370 (269)
Total CO2, kg/year			237.1872 (272)
CO2 emissions per m2			4.7700 (273)
EI value			96.6438
EI rating			97 (274)
EI band			A

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	49.7000 (1b)	x 2.4000 (2b)	= 119.2800 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.7000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	119.2800 (5)

2. Ventilation rate

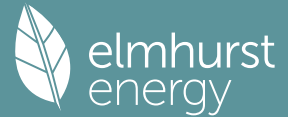
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.1677 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.3177 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2700 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	3.8000	3.5000	3.7000	3.4000	3.5000	3.0000	3.1000	3.0000	3.0000	3.2000	3.1000	3.5000 (22)
Wind factor	0.9500	0.8750	0.9250	0.8500	0.8750	0.7500	0.7750	0.7500	0.7500	0.8000	0.7750	0.8750 (22a)
Adj infilt rate	0.2565	0.2363	0.2498	0.2295	0.2363	0.2025	0.2093	0.2025	0.2025	0.2160	0.2093	0.2363 (22b)
Effective ac	0.5329	0.5279	0.5312	0.5263	0.5279	0.5205	0.5219	0.5205	0.5205	0.5233	0.5219	0.5279 (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							
Ent Door			1.9600	1.2000	2.3520		(26a)
Windows			7.8300	1.1450	8.9656		(27)
Heatloss Floor 1			49.7000	0.1200	5.9640	75.0000	3727.5000 (28a)
External Wall 1	35.7600	9.7900	25.9700	0.2000	5.1940	60.0000	1558.2000 (29a)
Total net area of external elements Aum(A, m2)			85.4600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.4756		(33)
Main dwelling							
Party Wall 1			36.9600	0.0000	0.0000	70.0000	2587.2000 (32)
Party Ceiling 1			49.7000			30.0000	1491.0000 (32b)
Internal Wall 1			69.1200			9.0000	622.0800 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9985.9800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							200.9252 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				5.7300	0.0480	0.2750	
E3 Sill				4.8000	0.0450	0.2160	
E4 Jamb				13.8000	0.0510	0.7038	
E5 Ground floor (normal)				14.9000	0.0640	0.9536	
E16 Corner (normal)				2.4000	0.0570	0.1368	
E18 Party wall between dwellings				4.8000	0.0620	0.2976	
P1 Party wall - Ground floor				15.4000	0.3200	4.9280	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.5108 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	29.9865 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.9763	20.7799	20.9090	20.7180	20.7799	20.4884	20.5431	20.4884	20.4884	20.5996	20.5431	20.7799	(38)
Heat transfer coeff	50.9628	50.7664	50.8955	50.7045	50.7664	50.4749	50.5296	50.4749	50.4749	50.5861	50.5296	50.7664	(39)
Average = Sum(39)m / 12 =												50.6610	
HLP	1.0254	1.0215	1.0241	1.0202	1.0215	1.0156	1.0167	1.0156	1.0156	1.0178	1.0167	1.0215	(40)
HLP (average)												1.0193	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6813 (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)													
Daily hot water use													
Energy conte													
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
Water storage loss:													
Store volume													201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6100 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8694 (55)
Total storage loss													
If cylinder contains dedicated solar storage													
Primary loss													
Combi loss													
Total heat required for water heating calculated for each month													
WWHRS													
PV diverter													
Solar input													
FGHRS													
Output from w/h													
Electric shower(s)													
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													
Heat gains from water heating, kWh/month													

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

Metabolic gains (Table 5), Watts													
(66)m													
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
Pumps, fans													
Losses e.g. evaporation (negative values) (Table 5)													
Water heating gains (Table 5)													
Total internal gains													

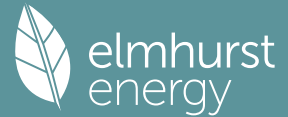
6. Solar gains

[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					5.4000	12.7650	0.5100	0.0000	0.7700		27.0693 (74)	
South					2.4300	54.2217	0.5100	0.0000	0.7700		51.7417 (78)	
Solar gains	78.8110	119.4621	171.0342	234.9149	275.6379	299.9299	283.2883	249.7302	202.3471	143.9472	93.3477	67.6488 (83)
Total gains	468.5494	507.2247	546.0624	588.2436	606.0342	608.3461	577.8928	549.3812	513.5757	477.3147	452.4726	448.1324 (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	54.4296	54.6402	54.5015	54.7069	54.6402	54.9557	54.8962	54.9557	54.8962	54.9557	54.8962	54.6402	
alpha	4.6286	4.6427	4.6334	4.6471	4.6427	4.6637	4.6597	4.6637	4.6637	4.6557	4.6597	4.6427	
util living area	0.9657	0.9495	0.9045	0.8081	0.6503	0.4344	0.2966	0.3205	0.5842	0.8302	0.9407	0.9713 (86)	

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MIT	20.0479	20.1984	20.4797	20.7570	20.9284	20.9914	20.9989	20.9984	20.9660	20.7652	20.3656	19.9967 (87)
Th 2	20.0622	20.0655	20.0633	20.0665	20.0655	20.0704	20.0694	20.0704	20.0704	20.0685	20.0694	20.0655 (88)
util rest of house												
	0.9577	0.9380	0.8832	0.7692	0.5901	0.3606	0.2158	0.2359	0.5061	0.7866	0.9251	0.9644 (89)
MIT 2	18.9887	19.1772	19.5171	19.8371	20.0106	20.0662	20.0692	20.0700	20.0497	19.8559	19.3902	18.9276 (90)
Living area fraction									fLA = Living area / (4) =			0.4588 (91)
MIT	19.4746	19.6457	19.9587	20.2591	20.4317	20.4906	20.4957	20.4959	20.4701	20.2730	19.8377	19.4181 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4746	19.6457	19.9587	20.2591	20.4317	20.4906	20.4957	20.4959	20.4701	20.2730	19.8377	19.4181 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9516	0.9320	0.8806	0.7778	0.6144	0.3942	0.2529	0.2748	0.5405	0.7970	0.9206	0.9586 (94)	
Useful gains	445.8691	472.7233	480.8472	457.5242	372.3656	239.8233	146.1364	150.9498	277.5947	380.4060	416.5479	429.5750 (95)	
Ext temp.	5.0000	5.5000	7.4000	9.8000	12.7000	15.7000	17.6000	17.5000	14.8000	11.4000	7.8000	4.9000 (96)	
Heat loss rate W													
	737.6670	718.1237	639.1824	530.3234	392.5083	241.8053	146.3179	151.2172	286.1975	448.8512	608.2576	737.0303 (97)	
Space heating kWh													
	217.0977	164.9091	117.8014	52.4154	14.9862	0.0000	0.0000	0.0000	0.0000	50.9232	138.0310	228.7468 (98a)	
Space heating requirement - total per year (kWh/year)												984.9108	
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													
	217.0977	164.9091	117.8014	52.4154	14.9862	0.0000	0.0000	0.0000	0.0000	50.9232	138.0310	228.7468 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												984.9108	
Space heating per m2										(98c) / (4) =		19.8171 (99)	

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	217.0977	164.9091	117.8014	52.4154	14.9862	0.0000	0.0000	0.0000	0.0000	50.9232	138.0310	228.7468 (98)	
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)	
Space heating fuel (main heating system)	217.0977	164.9091	117.8014	52.4154	14.9862	0.0000	0.0000	0.0000	0.0000	50.9232	138.0310	228.7468 (211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)	
Space heating fuel used, main system 2												0.0000 (213)	
Water heating													
Water heating requirement	178.7026	155.0703	158.9957	134.5724	124.0449	103.7250	97.8680	112.2710	119.0807	143.6044	159.4169	178.8481 (64)	
Efficiency of water heater (217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100 (216)	
Fuel for water heating, kWh/month	51.1441	44.3806	45.5041	38.5142	35.5012	29.6858	28.0095	32.1316	34.0805	41.0991	45.6246	51.1857 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)	
Lighting	18.9190	15.1775	13.6657	10.0121	7.7336	6.3184	7.0549	9.1702	11.9111	15.6281	17.6519	19.4448 (232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-13.5031	-18.4434	-28.2229	-33.5193	-35.7579	-34.3752	-33.8093	-31.4846	-26.6682	-22.2601	-15.0130	-11.5653 (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	0.3437	0.3480	-0.3065	-2.4914	-5.3362	-6.9555	-6.8102	-5.8491	-4.1257	-1.1450	0.1451	0.3278 (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												984.9108 (211)	
Space heating fuel - main system 2												0.0000 (213)	
Space heating fuel - secondary												0.0000 (215)	
Efficiency of water heater												349.4100	
Water heating fuel used												476.8610 (219)	
Space cooling fuel												0.0000 (221)	
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000 (231)	
Electricity for lighting (calculated in Appendix L)												152.6873 (232)	
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-336.4773 (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												1277.9818 (238)	

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10a. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1 (high-rate cost)	984.9108	34.6000	340.7791 (240)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (240)
Space heating - main system 2 (1.00*34.60 + 0.00*15.80)	0.0000	34.6000	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (electric off-peak tariff)			
High-rate fraction			0.0325 (243)
Low-rate fraction			0.9675 (244)
High-rate cost	15.5084	34.6000	5.3659 (245)
Low-rate cost	461.3526	15.8000	72.8937 (246)
Energy for instantaneous electric shower(s)	0.0000	32.7200	0.0000 (247a)
Pumps, fans and electric keep-hot (0.90*34.60 + 0.10*15.80)	0.0000	0.0000	0.0000 (249)
Energy for lighting (0.90*34.60 + 0.10*15.80)	152.6873	32.7200	49.9593 (250)
Additional standing charges			8.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-304.6223	32.7200	-99.6724
PV Unit electricity exported	-31.8549	5.8100	-1.8508
Total			-101.5232 (252)
Total energy cost			375.4748 (255)

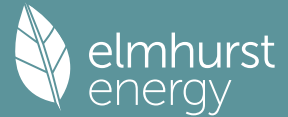
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1 (high-rate cost)	984.9108	0.1644	161.9315 (261)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (261)
Space heating - main system 2 (high-rate cost)	0.0000	0.0000	0.0000 (262)
Space heating - main system 2 (low-rate cost)	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating - high rate cost	15.5084	0.1493	2.3151 (264)
Water heating - low rate cost	461.3526	0.1253	57.8025 (264)
Space and water heating			222.0490 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	152.6873	0.1490	22.7534 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-304.6223	0.1383	-42.1392
PV Unit electricity exported	-31.8549	0.1074	-3.4202
Total			-45.5595 (269)
Total CO2, kg/year			199.2430 (272)

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 (high-rate cost)	984.9108	1.6128	1588.4340 (275)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (275)
Space heating - main system 2 (high-rate cost)	0.0000	0.0000	0.0000 (276)
Space heating - main system 2 (low-rate cost)	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating - high rate cost	15.5084	1.5579	24.1599 (278)
Water heating - low rate cost	461.3526	1.4489	668.4363 (278)
Space and water heating			2281.0302 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	152.6873	1.5547	237.3898 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-304.6223	1.5157	-461.7198
PV Unit electricity exported	-31.8549	0.3931	-12.5236
Total			-474.2434 (283)
Total Primary energy kWh/year			2044.1766 (286)

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Property Reference	P1 Ladds				Issued on Date	27/08/2025
Assessment Reference	Grd Flr Flat elec			Prop Type Ref	Semi	
Property	1, Bath Road, Hare Hatch, Berkshire, RG10 9SA					
SAP Rating	86 B	DER	5.31	TER	13.00	
Environmental	97 A	% DER < TER				59.15
CO ₂ Emissions (t/year)	0.19	DFEE	31.35	TFEE	31.50	
Compliance Check	See BREL	% DFEE < TFEE				0.49
% DPER < TPER	17.64	DPER	56.25	TPER	68.30	
Assessor Details	Mrs. Naomi Sadler				Assessor ID	4611-0001
Client	Westbourne Homes, Westbourne Homes					

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	49.7000 (1b)	2.4000 (2b)	119.2800 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.7000		119.2800 (4)
Dwelling volume			119.2800 (5)

2. Ventilation rate

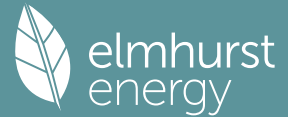
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	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) = 0.1677 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.3177 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2700 (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	0.3443	0.3375	0.3308	0.2970	0.2903	0.2565	0.2565	0.2498	0.2700	0.2903	0.3038	0.3173 (22b)
Effective ac	0.5593	0.5570	0.5547	0.5441	0.5421	0.5329	0.5329	0.5312	0.5365	0.5421	0.5461	0.5503 (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							
Ent Door			1.9600	1.2000	2.3520		(26a)
Windows			7.8300	1.1450	8.9656		(27)
Heatloss Floor 1			49.7000	0.1200	5.9640	75.0000	3727.5000 (28a)
External Wall 1	35.7600	9.7900	25.9700	0.2000	5.1940	60.0000	1558.2000 (29a)
Total net area of external elements Aum(A, m ²)			85.4600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.4756		(33)
Main dwelling							
Party Wall 1			36.9600	0.0000	0.0000	70.0000	2587.2000 (32)
Party Ceiling 1			49.7000			20.0000	994.0000 (32b)
Internal Wall 1			69.1200			9.0000	622.0800 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9488.9800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							190.9252 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				5.7300	0.0480	0.2750	
E3 Sill				4.8000	0.0450	0.2160	
E4 Jamb				13.8000	0.0510	0.7038	
E5 Ground floor (normal)				14.9000	0.0640	0.9536	
E16 Corner (normal)				2.4000	0.0570	0.1368	

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E18 Party wall between dwellings	4.8000	0.0620	0.2976	
P1 Party wall - Ground floor	15.4000	0.3200	4.9280	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				7.5108 (36)
Point Thermal bridges				0.0000
Total fabric heat loss		(33) + (36) + (36a) =		29.9865 (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	22.0140	21.9234	21.8346	21.4175	21.3395	20.9763	20.9763	20.9090	21.1162	21.3395	21.4974	21.6624 (38)
Average = Sum(39)m / 12 =	52.0004	51.9099	51.8211	51.4040	51.3260	50.9628	50.9628	50.8955	51.1027	51.3260	51.4838	51.6489 (39)
												51.4037
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0463	1.0445	1.0427	1.0343	1.0327	1.0254	1.0254	1.0241	1.0282	1.0327	1.0359	1.0392 (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												1.6813 (42)
Hot water usage for mixer showers												
Hot water usage for baths	52.4089	51.6213	50.4736	48.2777	46.6572	44.8500	43.8228	44.9618	46.2103	48.1507	50.3938	52.2081 (42a)
Hot water usage for other uses	22.6608	22.3242	21.8503	20.9765	20.3221	19.5966	19.2047	19.6753	20.1877	20.9641	21.8559	22.5842 (42b)
Average daily hot water use (litres/day)	31.8479	30.6898	29.5317	28.3736	27.2155	26.0574	26.0574	27.2155	28.3736	29.5317	30.6898	31.8479 (42c)
												98.2820 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	106.9176	104.6353	101.8556	97.6277	94.1948	90.5040	89.0849	91.8526	94.7717	98.6465	102.9395	106.6401 (44)
Energy content (annual)	169.3313	148.9993	156.5482	133.6475	126.8043	111.2852	107.7404	113.7327	116.8629	133.8623	146.6562	166.9727 (45)
Distribution loss (46)m = 0.15 x (45)m	25.3997	22.3499	23.4822	20.0471	19.0206	16.6928	16.1611	17.0599	17.5294	20.0794	21.9984	25.0459 (46)
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.9700 (48)
Temperature factor from Table 2b												0.6000 (49)
Enter (49) or (54) in (55)												0.5820 (55)
Total storage loss	18.0420	16.2960	18.0420	17.4600	18.0420	17.4600	18.0420	18.0420	17.4600	18.0420	17.4600	18.0420 (56)
If cylinder contains dedicated solar storage	18.0420	16.2960	18.0420	17.4600	18.0420	17.4600	18.0420	18.0420	17.4600	18.0420	17.4600	18.0420 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	187.3733	165.2953	174.5902	151.1075	144.8463	128.7452	125.7824	131.7747	134.3229	151.9043	164.1162	185.0147 (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	-14.2325	-29.9306	-59.7350	-90.2184	-119.6991	-120.4957	-118.8801	-100.1928	-72.9741	-42.7486	-18.9661	-11.2457 (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	173.1408	135.3647	114.8552	60.8891	25.1472	8.2495	6.9024	31.5819	61.3488	109.1558	145.1501	173.7690 (64)
12Total per year (kWh/year)												1045.5544 (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	1046 (64)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	56.3026	49.5423	52.0523	44.4378	42.1624	37.0023	35.8237	37.8161	38.8569	44.5092	48.7632	55.5184 (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	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.3042	85.5868	77.3042	79.8810	77.3042	79.8810	77.3042	77.3042	79.8810	77.3042	79.8810	77.3042 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	146.4548	147.9745	144.1448	135.9919	125.7002	116.0275	109.5655	108.0457	111.8754	120.0284	130.3201	139.9928 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064 (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)	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509 (71)
Water heating gains (Table 5)	75.6756	73.7236	69.9627	61.7192	56.6699	51.3921	48.1501	50.8281	53.9680	59.8242	67.7266	74.6215 (72)
Total internal gains	347.6537	355.5040	339.6309	325.8111	307.8934	295.5197	283.2389	284.3971	293.9435	305.3759	326.1468	340.1376 (73)

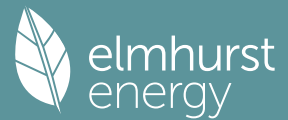
6. Solar gains

[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					5.4000	10.6334	0.5100	0.0000				0.7700	22.5490 (74)
South					2.4300	46.7521	0.5100	0.0000				0.7700	44.6137 (78)
Solar gains	67.1626	116.1579	166.2969	222.8092	268.0576	275.1069	261.4292	225.7334	185.2647	130.1039	80.6995	57.3482 (83)	
Total gains	414.8163	471.6619	505.9278	548.6203	575.9510	570.6265	544.6681	510.1305	479.2082	435.4798	406.8463	397.4859 (84)	

7. Mean internal temperature (heating season)

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

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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	50.6886	50.7770	50.8640	51.2767	51.3546	51.7207	51.7207	51.7890	51.5791	51.3546	51.1972	51.0336
alpha	4.3792	4.3851	4.3909	4.4184	4.4236	4.4480	4.4480	4.4526	4.4386	4.4236	4.4131	4.4022
util living area	0.9791	0.9628	0.9347	0.8627	0.7320	0.5502	0.4070	0.4511	0.6744	0.8880	0.9625	0.9823 (86)
MIT	19.7447	19.9633	20.2431	20.5951	20.8482	20.9667	20.9930	20.9891	20.9198	20.5994	20.1180	19.7020 (87)
Th 2	20.0449	20.0464	20.0479	20.0549	20.0562	20.0622	20.0622	20.0633	20.0599	20.0562	20.0535	20.0508 (88)
util rest of house	0.9742	0.9545	0.9200	0.8330	0.6800	0.4774	0.3225	0.3629	0.6017	0.8569	0.9527	0.9782 (89)
MIT 2	18.6002	18.8751	19.2229	19.6481	19.9260	20.0413	20.0594	20.0586	20.0031	19.6641	19.0780	18.5505 (90)
Living area fraction									FLA = Living area / (4) =			0.4588 (91)
MIT	19.1253	19.3743	19.6909	20.0826	20.3490	20.4659	20.4877	20.4855	20.4236	20.0932	19.5551	19.0788 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1253	19.3743	19.6909	20.0826	20.3490	20.4659	20.4877	20.4855	20.4236	20.0932	19.5551	19.0788 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9683	0.9474	0.9136	0.8340	0.6969	0.5094	0.3612	0.4031	0.6311	0.8583	0.9463	0.9727 (94)
Useful gains	401.6488	446.8516	462.2252	457.5229	401.3977	290.6710	196.7196	205.6497	302.4129	373.7753	385.0172	386.6422 (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	770.9203	751.3600	683.5676	574.8291	443.9203	298.9400	198.1283	207.9319	323.1550	487.2462	641.2388	768.4710 (97)
Space heating kWh	274.7380	204.6296	164.6787	84.4605	31.6368	0.0000	0.0000	0.0000	0.0000	84.4223	184.4795	284.0806 (98a)
Space heating requirement - total per year (kWh/year)												1313.1261
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	274.7380	204.6296	164.6787	84.4605	31.6368	0.0000	0.0000	0.0000	0.0000	84.4223	184.4795	284.0806 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1313.1261
Space heating per m2										(98c) / (4) =		26.4210 (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 %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	274.7380	204.6296	164.6787	84.4605	31.6368	0.0000	0.0000	0.0000	0.0000	84.4223	184.4795	284.0806 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	274.7380	204.6296	164.6787	84.4605	31.6368	0.0000	0.0000	0.0000	0.0000	84.4223	184.4795	284.0806 (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	173.1408	135.3647	114.8552	60.8891	25.1472	8.2495	6.9024	31.5819	61.3488	109.1558	145.1501	173.7690 (64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month	173.1408	135.3647	114.8552	60.8891	25.1472	8.2495	6.9024	31.5819	61.3488	109.1558	145.1501	173.7690 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	18.9190	15.1775	13.6657	10.0121	7.7336	6.3184	7.0549	9.1702	11.9111	15.6281	17.6519	19.4448 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-36.2077	-52.2645	-74.9609	-79.0746	-76.1206	-63.2485	-62.4459	-59.8022	-54.6470	-55.1267	-39.5114	-31.1940 (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	1.9351	1.9407	-1.0131	-11.4548	-26.5632	-34.5811	-34.1167	-28.6464	-20.7338	-4.2208	1.1750	1.7753 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1313.1261 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												100.0000
Water heating fuel used												1045.5544 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												152.6873 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-839.1076 (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)

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Total delivered energy for all uses

1672.2602 (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 (high-rate cost)	1313.1261	0.1635	214.7041 (261)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating - high rate cost	34.0034	0.1579	5.3700 (264)
Water heating - low rate cost	1011.5509	0.1326	134.0925 (264)
Space and water heating			354.1667 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	152.6873	0.1490	22.7534 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-684.6039	0.1410	-96.5523
PV Unit electricity exported	-154.5037	0.1061	-16.3918
Total			-112.9441 (269)
Total CO2, kg/year			263.9759 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.3100 (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 (high-rate cost)	1313.1261	1.6095	2113.4975 (275)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating - high rate cost	34.0034	1.5892	54.0374 (278)
Water heating - low rate cost	1011.5509	1.4780	1495.1184 (278)
Space and water heating			3662.6533 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	152.6873	1.5547	237.3898 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-684.6039	1.5256	-1044.4487
PV Unit electricity exported	-154.5037	0.3883	-60.0007
Total			-1104.4494 (283)
Total Primary energy kWh/year			2795.5937 (286)
Dwelling Primary energy Rate (DPER)			56.2500 (287)

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

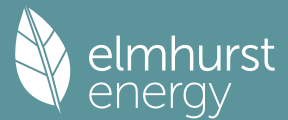
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	49.7000 (1b)	x 2.4000 (2b)	= 119.2800 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.7000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 119.2800 (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) = 0.1677 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4177 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3550 (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	0.4527 0.4438 0.4349 0.3905 0.3816 0.3373 0.3373 0.3284 0.3550 0.3816 0.3994 0.4172 (22b)
Effective ac	0.6024 0.5985 0.5946 0.5763 0.5728 0.5569 0.5569 0.5539 0.5630 0.5728 0.5798 0.5870 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Main dwelling													
TER Semi-glazed door			1.9600	1.0000	1.9600			(26a)					
TER Opening Type			7.8300	1.1450	8.9656			(27)					
Heatloss Floor 1			49.7000	0.1300	6.4610			(28a)					
External Wall 1	35.7600	9.7900	25.9700	0.1800	4.6746			(29a)					
Total net area of external elements Aum(A, m2)			85.4600					(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)... (30) + (32) =	22.0612		(33)					
Main dwelling													
Party Wall 1			36.9600	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							200.9252	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value		Total						
E2 Other lintels (including other steel lintels)				5.7300	0.0500		0.2865						
E3 Sill				4.8000	0.0500		0.2400						
E4 Jamb				13.8000	0.0500		0.6900						
E5 Ground floor (normal)				14.9000	0.1600		2.3840						
E16 Corner (normal)				2.4000	0.0900		0.2160						
E18 Party wall between dwellings				4.8000	0.0600		0.2880						
P1 Party wall - Ground floor				15.4000	0.0800		1.2320						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.3365	(36)					
Point Thermal Bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	27.3977	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 23.7138	Feb 23.5572	Mar 23.4037	Apr 22.6828	May 22.5479	Jun 21.9200	Jul 21.9200	Aug 21.8037	Sep 22.1618	Oct 22.5479	Nov 22.8207	Dec 23.1060	(38)
Heat transfer coeff	51.1115	50.9549	50.8014	50.0805	49.9456	49.3177	49.3177	49.2014	49.5596	49.9456	50.2185	50.5038	(39)
Average = Sum(39)m / 12 =												50.0799	
HLP	Jan 1.0284	Feb 1.0253	Mar 1.0222	Apr 1.0077	May 1.0049	Jun 0.9923	Jul 0.9923	Aug 0.9900	Sep 0.9972	Oct 1.0049	Nov 1.0104	Dec 1.0162	(40)
HLP (average)												1.0076	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

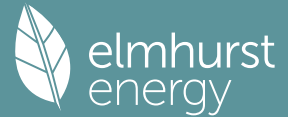
4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6813 (42)
Hot water usage for mixer showers													
52.4089	51.6213	50.4736	48.2777	46.6572	44.8500	43.8228	44.9618	46.2103	48.1507	50.3938	52.2081	52.2081	(42a)
Hot water usage for baths													
22.6608	22.3242	21.8503	20.9765	20.3221	19.5966	19.2047	19.6753	20.1877	20.9641	21.8559	22.5842	22.5842	(42b)
Hot water usage for other uses													
31.8479	30.6898	29.5317	28.3736	27.2155	26.0574	26.0574	27.2155	28.3736	29.5317	30.6898	31.8479	31.8479	(42c)
Average daily hot water use (litres/day)												98.2820	(43)
Daily hot water use	Jan 106.9176	Feb 104.6353	Mar 101.8556	Apr 97.6277	May 94.1948	Jun 90.5040	Jul 89.0849	Aug 91.8526	Sep 94.7717	Oct 98.6465	Nov 102.9395	Dec 106.6401	(44)
Energy conte	169.3313	148.9993	156.5482	133.6475	126.8043	111.2852	107.7404	113.7327	116.8629	133.8623	146.6562	166.9727	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
25.3997	22.3499	23.4822	20.0471	19.0206	16.6928	16.1611	17.0599	17.5294	20.0794	21.9984	25.0459	25.0459	(46)
Water storage loss:													
Store volume												201.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6575	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8950	(55)
Total storage loss													
27.7463	25.0612	27.7463	26.8513	27.7463	26.8513	27.7463	27.7463	26.8513	27.7463	26.8513	27.7463	27.7463	(56)
If cylinder contains dedicated solar storage													
27.7463	25.0612	27.7463	26.8513	27.7463	26.8513	27.7463	27.7463	26.8513	27.7463	26.8513	27.7463	27.7463	(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													
220.3400	195.0717	207.5570	183.0108	177.8130	160.6485	158.7491	164.7414	166.2262	184.8711	196.0195	217.9814	217.9814	(62)
WWHRS	-23.9592	-21.1897	-22.1886	-18.3730	-17.1230	-14.6523	-13.7342	-14.6049	-15.1598	-17.8718	-20.2465	-23.5155	(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	196.3808	173.8820	185.3684	164.6377	160.6900	145.9962	145.0150	150.1365	151.0664	166.9993	175.7729	194.4660	(64)
12Total per year (kWh/year)												2010.4112	(64)
Electric shower(s)												2010	(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													
97.1096	86.4002	92.8593	83.9284	82.9694	76.4930	76.6307	78.6231	78.3476	85.3162	88.2538	96.3254	96.3254	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan 84.0636	Feb 84.0636	Mar 84.0636	Apr 84.0636	May 84.0636	Jun 84.0636	Jul 84.0636	Aug 84.0636	Sep 84.0636	Oct 84.0636	Nov 84.0636	Dec 84.0636	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
77.3042	85.5868	77.3042	79.8810	77.3042	79.8810	77.3042	77.3042	77.3042	79.8810	77.3042	79.8810	77.3042	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
146.4548	147.9745	144.1448	135.9919	125.7002	116.0275	109.5655	108.0457	111.8754	120.0284	130.3201	139.9928	139.9928	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	(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)													
-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	(71)
Water heating gains (Table 5)													
130.5237	128.5717	124.8108	116.5672	111.5180	106.2402	102.9982	105.6762	108.8160	114.6723	122.5747	129.4696	129.4696	(72)
Total internal gains	405.5018	413.3521	397.4790	383.6592	365.7415	350.3678	338.0870	339.2452	348.7916	363.2240	383.9949	397.9857	(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				5.4000	10.6334	0.6300	0.7000	0.7700	17.5484 (74)			
South				2.4300	46.7521	0.6300	0.7000	0.7700	34.7199 (78)			
Solar gains	52.2683	90.3982	129.4181	173.3980	208.6119	214.0979	203.4535	175.6737	144.1795	101.2514	62.8032	44.6304 (83)
Total gains	457.7701	503.7503	526.8971	557.0572	574.3534	564.4656	541.5404	514.9189	492.9711	464.4755	446.7981	442.6162 (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	54.2712	54.4380	54.6025	55.3885	55.5381	56.2452	56.2452	56.3781	55.9707	55.5381	55.2363	54.9243
alpha	4.6181	4.6292	4.6402	4.6926	4.7025	4.7497	4.7497	4.7585	4.7314	4.7025	4.6824	4.6616
util living area	0.9731	0.9569	0.9292	0.8571	0.7275	0.5430	0.3976	0.4346	0.6507	0.8674	0.9516	0.9764 (86)
MIT	19.9300	20.1123	20.3514	20.6615	20.8771	20.9759	20.9955	20.9932	20.9441	20.6928	20.2818	19.9056 (87)
Th 2	20.0597	20.0623	20.0649	20.0770	20.0792	20.0897	20.0897	20.0917	20.0857	20.0792	20.0746	20.0699 (88)
util rest of house	0.9669	0.9472	0.9131	0.8263	0.6753	0.4719	0.3169	0.3511	0.5788	0.8324	0.9392	0.9709 (89)
MIT 2	18.8388	19.0677	19.3642	19.7409	19.9755	20.0750	20.0880	20.0889	20.0474	19.7857	19.2912	18.8158 (90)
Living area fraction									fLA = Living area / (4) =			0.4588 (91)
MIT	19.3394	19.5469	19.8171	20.1632	20.3891	20.4883	20.5043	20.5038	20.4588	20.2018	19.7456	19.3157 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3394	19.5469	19.8171	20.1632	20.3891	20.4883	20.5043	20.5038	20.4588	20.2018	19.7456	19.3157 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9609	0.9408	0.9083	0.8294	0.6936	0.5036	0.3539	0.3893	0.6092	0.8376	0.9339	0.9653 (94)
Useful gains	439.8936	473.9530	478.5570	462.0496	398.3874	284.2602	191.6370	200.4779	300.3110	389.0259	417.2614	427.2604 (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	768.6870	746.3312	676.5265	564.0681	433.9824	290.3957	192.5530	201.9108	315.1386	479.5689	635.0432	763.4006 (97)
Space heating kWh	244.6223	183.0382	147.2893	73.4533	26.4827	0.0000	0.0000	0.0000	0.0000	67.3640	156.8029	250.0883 (98a)
Space heating requirement - total per year (kWh/year)												1149.1411
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	244.6223	183.0382	147.2893	73.4533	26.4827	0.0000	0.0000	0.0000	0.0000	67.3640	156.8029	250.0883 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1149.1411
Space heating per m2										(98c) / (4) =		23.1216 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	244.6223	183.0382	147.2893	73.4533	26.4827	0.0000	0.0000	0.0000	0.0000	67.3640	156.8029	250.0883 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	265.0295	198.3079	159.5767	79.5811	28.6920	0.0000	0.0000	0.0000	0.0000	72.9837	169.8840	270.9516 (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	196.3808	173.8820	185.3684	164.6377	160.6900	145.9962	145.0150	150.1365	151.0664	166.9993	175.7729	194.4660 (64)
Efficiency of water heater (217)m	84.5535	84.1751	83.5493	82.3757	80.9610	79.8000	79.8000	79.8000	79.8000	82.1945	83.8046	79.8000 (216)
Fuel for water heating, kWh/month	232.2563	206.5719	221.8671	199.8620	198.4783	182.9526	181.7230	188.1410	189.3063	203.1758	209.7413	229.7973 (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	16.0623	12.8858	11.6022	8.5003	6.5659	5.3644	5.9896	7.7855	10.1126	13.2683	14.9865	16.5087 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-23.7136	-33.6724	-48.7652	-55.2905	-60.0607	-56.2761	-55.6371	-52.3390	-46.5376	-38.7698	-26.1773	-20.4783 (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	-12.6717	-26.7391	-53.2786	-80.1924	-106.1695	-106.6736	-105.3632	-89.1018	-65.2025	-38.2323	-16.9215	-10.0097 (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)												

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(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												1245.0066	(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												2443.8730	(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)												129.6319	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1228.2735	(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												2676.2379	(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	1245.0066	0.2100	261.4514	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2443.8730	0.2100	513.2133	(264)
Space and water heating			774.6647	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	129.6319	0.1443	18.7099	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-517.7176	0.1344	-69.5804	
PV Unit electricity exported	-710.5559	0.1258	-89.4204	
Total			-159.0008	(269)
Total CO2, kg/year			646.3031	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.0000	(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	1245.0066	1.1300	1406.8574	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2443.8730	1.1300	2761.5765	(278)
Space and water heating			4168.4339	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	129.6319	1.5338	198.8337	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-517.7176	1.4967	-774.8692	
PV Unit electricity exported	-710.5559	0.4619	-328.2336	
Total			-1103.1028	(283)
Total Primary energy kWh/year			3394.2656	(286)
Target Primary Energy Rate (TPER)			68.3000	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

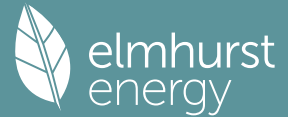
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	49.7000	2.4000	119.2800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.7000			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	119.2800	(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) =	
Pressure test	20.0000 / (5) =	
Pressure Test Method	Yes	
Measured/design AP50	Blower Door	
Infiltration rate	3.0000 (17)	
	0.3177 (18)	

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Number of sides sheltered

2 (19)

Shelter factor

(20) = 1 - [0.075 x (19)] = 0.8500 (20)

Infiltration rate adjusted to include shelter factor

(21) = (18) x (20) = 0.2700 (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)
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)
	0.3443	0.3375	0.3308	0.2970	0.2903	0.2565	0.2565	0.2498	0.2700	0.2903	0.3038	0.3173	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													0.0000 (23c)
Effective ac	0.5593	0.5570	0.5547	0.5441	0.5421	0.5329	0.5329	0.5312	0.5365	0.5421	0.5461	0.5503	(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								
Ent Door			1.9600	1.2000	2.3520			(26a)
Windows			7.8300	1.1450	8.9656			(27)
Heatloss Floor 1			49.7000	0.1200	5.9640	75.0000	3727.5000	(28a)
External Wall 1	35.7600	9.7900	25.9700	0.2000	5.1940	60.0000	1558.2000	(29a)
Total net area of external elements Aum(A, m2)			85.4600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =		22.4756		(33)
Main dwelling								
Party Wall 1			36.9600	0.0000	0.0000	70.0000	2587.2000	(32)
Party Ceiling 1			49.7000			30.0000	1491.0000	(32b)
Internal Wall 1			69.1200			9.0000	622.0800	(32c)

Heat capacity Cm = Sum(A x k)

(28)...(30) + (32) + (32a)...(32e) = 9985.9800 (34)

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

200.9252 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	5.7300	0.0480	0.2750	
E3 Sill	4.8000	0.0450	0.2160	
E4 Jamb	13.8000	0.0510	0.7038	
E5 Ground floor (normal)	14.9000	0.0640	0.9536	
E16 Corner (normal)	2.4000	0.0570	0.1368	
E18 Party wall between dwellings	4.8000	0.0620	0.2976	
P1 Party wall - Ground floor	15.4000	0.3200	4.9280	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				7.5108 (36)
Point Thermal bridges				0.0000
Total fabric heat loss			(33) + (36) + (36a) =	29.9865 (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	22.0140	21.9234	21.8346	21.4175	21.3395	20.9763	20.9763	20.9090	21.1162	21.3395	21.4974	21.6624	(38)
Average = Sum(39)m / 12 =	52.0004	51.9099	51.8211	51.4040	51.3260	50.9628	50.9628	50.8955	51.1027	51.3260	51.4838	51.6489	(39)
												51.4037	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0463	1.0445	1.0427	1.0343	1.0327	1.0254	1.0254	1.0241	1.0282	1.0327	1.0359	1.0392	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	
												1.0343	

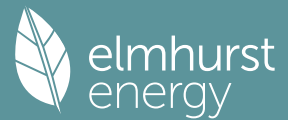
4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6813 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	22.6608	22.3242	21.8503	20.9765	20.3221	19.5966	19.2047	19.6753	20.1877	20.9641	21.8559	22.5842	(42b)
Hot water usage for other uses	31.8479	30.6898	29.5317	28.3736	27.2155	26.0574	26.0574	27.2155	28.3736	29.5317	30.6898	31.8479	(42c)
Average daily hot water use (litres/day)													49.9627 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	54.5087	53.0140	51.3820	49.3501	47.5376	45.6540	45.2621	46.8908	48.5613	50.4958	52.5457	54.4321	(44)
Energy content (annual)	86.3284	75.4913	78.9722	67.5578	63.9948	56.1369	54.7406	58.0606	59.8810	68.5223	74.8610	85.2275	(45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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	(59)
Total heat required for water heating calculated for each month	73.3791	64.1676	67.1264	57.4241	54.3956	47.7164	46.5295	49.3515	50.8988	58.2439	63.6318	72.4433	(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	73.3791	64.1676	67.1264	57.4241	54.3956	47.7164	46.5295	49.3515	50.8988	58.2439	63.6318	72.4433	(64)
Total per year (kWh/year)													705.3081 (64)
Electric shower(s)	41.9708	37.3963	40.8353	38.9687	39.6999	37.8698	39.1322	39.6999	38.9687	40.8353	40.0675	41.9708	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													477.4152 (64a)
Heat gains from water heating, kWh/month	28.8375	25.3910	26.9904	24.0982	23.5239	21.3966	21.4154	22.2629	22.4669	24.7698	25.9248	28.6035	(65)

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

Metabolic gains (Table 5), Watts

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.3042	85.5868	77.3042	79.8810	77.3042	79.8810	77.3042	77.3042	79.8810	77.3042	79.8810	77.3042	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	146.4548	147.9745	144.1448	135.9919	125.7002	116.0275	109.5655	108.0457	111.8754	120.0284	130.3201	139.9928	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	(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)	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	(71)
Water heating gains (Table 5)	38.7601	37.7842	36.2775	33.4697	31.6181	29.7174	28.7842	29.9232	31.2040	33.2928	36.0067	38.4456	(72)
Total internal gains	310.7381	319.5646	305.9456	297.5616	282.8416	273.8450	263.8729	263.4922	271.1795	278.8445	294.4269	303.9617	(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				5.4000	10.6334	0.5100		0.0000	0.7700		22.5490 (74)	
South				2.4300	46.7521	0.5100		0.0000	0.7700		44.6137 (78)	
Solar gains	67.1626	116.1579	166.2969	222.8092	268.0576	275.1069	261.4292	225.7334	185.2647	130.1039	80.6995	57.3482 (83)
Total gains	377.9008	435.7225	472.2425	520.3709	550.8992	548.9518	525.3022	489.2256	456.4442	408.9483	375.1264	361.3100 (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	53.3435	53.4365	53.5281	53.9624	54.0444	54.4296	54.4296	54.5015	54.2806	54.0444	53.8787	53.7066	
alpha	4.5562	4.5624	4.5685	4.5975	4.6030	4.6286	4.6286	4.6334	4.6187	4.6030	4.5919	4.5804	
util living area	0.9871	0.9748	0.9519	0.8861	0.7581	0.5713	0.4221	0.4702	0.7028	0.9115	0.9748	0.9894 (86)	
MIT	19.7063	19.9263	20.2110	20.5787	20.8437	20.9670	20.9934	20.9893	20.9166	20.5782	20.0840	19.6655 (87)	
Th 2	20.0449	20.0464	20.0479	20.0549	20.0562	20.0622	20.0622	20.0633	20.0599	20.0562	20.0535	20.0508 (88)	
util rest of house	0.9839	0.9687	0.9399	0.8588	0.7063	0.4961	0.3345	0.3784	0.6291	0.8840	0.9675	0.9867 (89)	
MIT 2	18.8778	19.0950	19.3731	19.7235	19.9519	20.0463	20.0602	20.0599	20.0142	19.7318	19.2580	18.8419 (90)	
Living area fraction	19.2579	19.4763	19.7575	20.1159	20.3610	20.4687	20.4883	20.4862	20.4282	20.1201	19.6369	19.2197 (92)	
MIT	19.2579	19.4763	19.7575	20.1159	20.3610	20.4687	20.4883	20.4862	20.4282	20.1201	19.6369	19.2197 (93)	
Temperature adjustment												0.0000	
adjusted MIT	19.2579	19.4763	19.7575	20.1159	20.3610	20.4687	20.4883	20.4862	20.4282	20.1201	19.6369	19.2197 (93)	

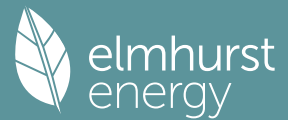
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9805	0.9641	0.9356	0.8607	0.7239	0.5294	0.3746	0.4204	0.6594	0.8861	0.9636	0.9836 (94)	
Useful gains	370.5212	420.0979	441.8401	447.8878	398.8194	290.6195	196.8002	205.6815	300.9597	362.3853	361.4692	355.3972 (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	777.8171	756.6558	687.0167	576.5400	444.5352	299.0858	198.1598	207.9711	323.3857	488.6283	645.4487	775.7521 (97)	
Space heating kWh	303.0282	226.1669	182.4114	92.6296	34.0125	0.0000	0.0000	0.0000	0.0000	93.9248	204.4653	312.7440 (98a)	
Space heating requirement - total per year (kWh/year)												1449.3828	
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	303.0282	226.1669	182.4114	92.6296	34.0125	0.0000	0.0000	0.0000	0.0000	93.9248	204.4653	312.7440 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1449.3828	
Space heating per m ²										(98c) / (4) =		29.1626 (99)	

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9064	0.9493	0.9306	0.0000	0.0000	0.0000	0.0000 (100)	
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	434.1916	358.0051	359.9807	0.0000	0.0000	0.0000	0.0000 (101)	
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	611.6044	585.5842	544.9239	0.0000	0.0000	0.0000	0.0000 (102)	
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	127.7372	169.3188	137.5978	0.0000	0.0000	0.0000	0.0000 (103)	
Cooled fraction													
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (104)	
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	31.9343	42.3297	34.3994	0.0000	0.0000	0.0000	0.0000 (105)	
Space cooling requirement													
Energy for space heating													
Energy for space cooling													
Total													
Fabric Energy Efficiency (DFEE)													

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

1. Overall dwelling characteristics

Main dwelling	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	49.7000 (1b)	x 2.4000 (2b)	= 119.2800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 119.2800 (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	2	*	10	=	20.0000	(7a)						
Number of passive vents	0	*	10	=	0.0000	(7b)						
Number of flueless gas fires	0	*	40	=	0.0000	(7c)						
Air changes per hour												
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000	/	(5)	=	0.1677	(8)						
Pressure test												Yes
Pressure Test Method												Blower Door
Measured/design AP50												5.0000 (17)
Infiltration rate												0.4177 (18)
Number of sides sheltered												2 (19)
Shelter factor	(20)	=	1	-	[0.075 x (19)]	=	0.8500	(20)				
Infiltration rate adjusted to include shelter factor	(21)	=	(18)	x	(20)	=	0.3550	(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)
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)
	0.4527	0.4438	0.4349	0.3905	0.3816	0.3373	0.3373	0.3284	0.3550	0.3816	0.3994	0.4172 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.6024	0.5985	0.5946	0.5763	0.5728	0.5569	0.5569	0.5539	0.5630	0.5728	0.5798	0.5870 (25)

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 Semi-glazed door			1.9600	1.0000	1.9600		(26a)
TER Opening Type			7.8300	1.1450	8.9656		(27)
Heatloss Floor 1			49.7000	0.1300	6.4610		(28a)
External Wall 1	35.7600	9.7900	25.9700	0.1800	4.6746		(29a)
Total net area of external elements Aum(A, m2)			85.4600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		22.0612		(33)
Main dwelling							
Party Wall 1			36.9600	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							200.9252 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				5.7300	0.0500	0.2865	
E3 Sill				4.8000	0.0500	0.2400	
E4 Jamb				13.8000	0.0500	0.6900	
E5 Ground floor (normal)				14.9000	0.1600	2.3840	
E16 Corner (normal)				2.4000	0.0900	0.2160	
E18 Party wall between dwellings				4.8000	0.0600	0.2880	
P1 Party wall - Ground floor				15.4000	0.0800	1.2320	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.3365 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	27.3977 (37)

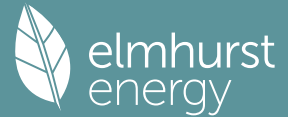
4. Water heating energy requirements (kWh/year)

Average = Sum(39)m / 12 =	51.1115	50.9549	50.8014	50.0805	49.9456	49.3177	49.3177	49.2014	49.5596	49.9456	50.2185	50.5038 (39)
												50.0799
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0284	1.0253	1.0222	1.0077	1.0049	0.9923	0.9923	0.9900	0.9972	1.0049	1.0104	1.0162 (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												1.6813 (42)
Hot water usage for mixer showers												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths												
	22.6608	22.3242	21.8503	20.9765	20.3221	19.5966	19.2047	19.6753	20.1877	20.9641	21.8559	22.5842 (42b)
Hot water usage for other uses												
	31.8479	30.6898	29.5317	28.3736	27.2155	26.0574	26.0574	27.2155	28.3736	29.5317	30.6898	31.8479 (42c)
Average daily hot water use (litres/day)												49.9627 (43)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	54.5087	53.0140	51.3820	49.3501	47.5376	45.6540	45.2621	46.8908	48.5613	50.4958	52.5457	54.4321	(44)
Energy conte	86.3284	75.4913	78.9722	67.5578	63.9948	56.1369	54.7406	58.0606	59.8810	68.5223	74.8610	85.2275	(45)
Energy content (annual)	Total = Sum(45)m = 829.7742												
Distribution loss	(46)m = 0.15 x (45)m												
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	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
73.3791	64.1676	67.1264	57.4241	54.3956	47.7164	46.5295	49.3515	50.8988	58.2439	63.6318	72.4433	72.4433	(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	73.3791	64.1676	67.1264	57.4241	54.3956	47.7164	46.5295	49.3515	50.8988	58.2439	63.6318	72.4433	(64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m = 705.3081												(64)
Electric shower(s)	41.9708	37.3963	40.8353	38.9687	39.6999	37.8698	39.1322	39.6999	38.9687	40.8353	40.0675	41.9708	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	477.4152												(64a)
Heat gains from water heating, kWh/month	28.8375	25.3910	26.9904	24.0982	23.5239	21.3966	21.4154	22.2629	22.4669	24.7698	25.9248	28.6035	(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	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	84.0636	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.3042	85.5868	77.3042	79.8810	77.3042	79.8810	77.3042	77.3042	79.8810	77.3042	79.8810	77.3042	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	146.4548	147.9745	144.1448	135.9919	125.7002	116.0275	109.5655	108.0457	111.8754	120.0284	130.3201	139.9928	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	31.4064	(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)	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	(71)
Water heating gains (Table 5)	38.7601	37.7842	36.2775	33.4697	31.6181	29.7174	28.7842	29.9232	31.2040	33.2928	36.0067	38.4456	(72)
Total internal gains	310.7381	319.5646	305.9456	297.5616	282.8416	273.8450	263.8729	263.4922	271.1795	278.8445	294.4269	303.9617	(73)

6. Solar gains

[Jan]												Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF factor Table 6d	Access factor Table 6d	Gains W
North												5.4000	10.6334	0.6300	0.7000	0.7700		17.5484 (74)
South												2.4300	46.7521	0.6300	0.7000	0.7700		34.7199 (78)
Solar gains	52.2683	90.3982	129.4181	173.3980	208.6119	214.0979	203.4535	175.6737	144.1795	101.2514	62.8032	44.6304 (83)						
Total gains	363.0065	409.9628	435.3637	470.9597	491.4535	487.9429	467.3264	439.1659	415.3590	380.0959	357.2301	348.5921 (84)						

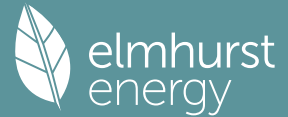
7. Mean internal temperature (heating season)

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	54.2712	54.4380	54.6025	55.3885	55.5381	56.2452	56.2452	56.3781	55.9707	55.5381	55.2363	54.9243
alpha	4.6181	4.6292	4.6402	4.6926	4.7025	4.7497	4.7497	4.7585	4.7314	4.7025	4.6824	4.6616
util living area	0.9888	0.9794	0.9624	0.9104	0.8006	0.6154	0.4578	0.5045	0.7370	0.9257	0.9783	0.9906 (86)
MIT	19.7032	19.9011	20.1661	20.5332	20.8128	20.9595	20.9919	20.9873	20.9054	20.5584	20.0825	19.6773 (87)
Th 2	20.0597	20.0623	20.0649	20.0770	20.0792	20.0897	20.0897	20.0917	20.0857	20.0792	20.0746	20.0699 (88)
util rest of house	0.9860	0.9743	0.9527	0.8873	0.7526	0.5393	0.3662	0.4099	0.6656	0.9017	0.9720	0.9882 (89)
MIT 2	18.8863	19.0833	19.3447	19.7033	19.9510	20.0697	20.0872	20.0875	20.0324	19.7347	19.2735	18.8685 (90)
Living area fraction	fLA = Living area / (4) = 0.4588 (91)											
MIT	19.2610	19.4585	19.7215	20.0840	20.3464	20.4779	20.5022	20.5003	20.4329	20.1126	19.6447	19.2395 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.2610	19.4585	19.7215	20.0840	20.3464	20.4779	20.5022	20.5003	20.4329	20.1126	19.6447	19.2395 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9829	0.9702	0.9485	0.8875	0.7675	0.5727	0.4082	0.4532	0.6943	0.9027	0.9683	0.9855	(94)
Useful gains	356.8019	397.7500	412.9359	417.9808	377.1786	279.4394	190.7652	199.0169	288.3701	343.1155	345.9218	343.5324	(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	764.6817	741.8250	671.6719	560.1022	431.8482	289.8829	192.4495	201.7398	313.8555	475.1116	629.9737	759.5520	(97)
Space heating kWh	303.4625	231.2184	192.4995	102.3275	40.6742	0.0000	0.0000	0.0000	0.0000	98.2051	204.5173	309.5186	(98a)
Space heating requirement - total per year (kWh/year)	1482.4231												
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													

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303.4625 231.2184 192.4995 102.3275 40.6742 0.0000 0.0000 0.0000 0.0000 98.2051 204.5173 309.5186 (98c)
 Space heating requirement after solar contribution - total per year (kWh/year) 1482.4231
 Space heating per m2 (98c) / (4) = 29.8274 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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												
	0.0000	0.0000	0.0000	0.0000	0.0000	463.5865	364.9511	373.9309	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8828	0.9353	0.9152	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	409.2556	341.3432	342.2170	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	540.2952	517.8203	486.4126	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	94.3485	131.2990	107.2815	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	23.5871	32.8247	26.8204	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												83.2322 (107)
Energy for space heating												29.8274 (99)
Energy for space cooling												1.6747 (108)
Total												31.5021 (109)
Fabric Energy Efficiency (TFEE)												31.5 (109)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	49.7000	2.4000	119.2800
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.7000		119.2800 (1b) - (3b)
Dwelling volume			119.2800 (4)
			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 119.2800 (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	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) = 0.1677 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.3177 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2700 (21)

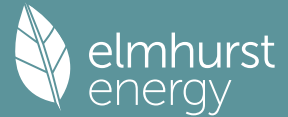
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
	0.3443	0.3375	0.3308	0.2970	0.2903	0.2565	0.2565	0.2498	0.2700	0.2903	0.3038	0.3173 (22b)
Effective ac	0.5593	0.5570	0.5547	0.5441	0.5421	0.5329	0.5329	0.5312	0.5365	0.5421	0.5461	0.5503 (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							
Ent Door			1.9600	1.2000	2.3520		(26a)
Windows			7.8300	1.1450	8.9656		(27)
Heatloss Floor 1			49.7000	0.1200	5.9640	75.0000	3727.5000 (28a)
External Wall 1	35.7600	9.7900	25.9700	0.2000	5.1940	60.0000	1558.2000 (29a)
Total net area of external elements Aum(A, m ²)			85.4600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.4756		(33)
Main dwelling							
Party Wall 1			36.9600	0.0000	0.0000	70.0000	2587.2000 (32)
Party Ceiling 1			49.7000			30.0000	1491.0000 (32b)
Internal Wall 1			69.1200			9.0000	622.0800 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		9985.9800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							200.9252 (35)
List of Thermal Bridges							

6. Solar gains													
[Jan]				Area	Solar flux		g		FF		Access		Gains
				m2	Table 6a		Specific data		or Table 6c		factor		W
					W/m2		or Table 6b				Table 6d		
North				5.4000	10.6334		0.5100		0.0000		0.7700		22.5490 (74)
South				2.4300	46.7521		0.5100		0.0000		0.7700		44.6137 (78)
Solar gains	67.1626	116.1579	166.2969	222.8092	268.0576	275.1069	261.4292	225.7334	185.2647	130.1039	80.6995	57.3482	(83)
Total gains	463.4363	510.3311	547.4083	579.7155	601.5696	587.5279	561.5642	528.6948	500.6670	467.3240	444.1671	443.5238	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	53.3435	53.4365	53.5281	53.9624	54.0444	54.4296	54.4296	54.5015	54.2806	54.0444	53.8787	53.7066	
alpha	4.5562	4.5624	4.5685	4.5975	4.6030	4.6286	4.6286	4.6334	4.6187	4.6030	4.5919	4.5804	
util living area	0.9725	0.9562	0.9229	0.8490	0.7157	0.5383	0.3959	0.4371	0.6563	0.8715	0.9544	0.9768 (86)	
MIT	19.9091	20.0914	20.3566	20.6601	20.8774	20.9741	20.9949	20.9921	20.9371	20.6686	20.2364	19.8637 (87)	
Th 2	20.0449	20.0464	20.0479	20.0549	20.0562	20.0622	20.0622	20.0633	20.0599	20.0562	20.0535	20.0508 (88)	
util rest of house	0.9661	0.9463	0.9057	0.8168	0.6622	0.4658	0.3132	0.3508	0.5828	0.8367	0.9424	0.9714 (89)	
MIT 2	18.8017	19.0296	19.3562	19.7193	19.9536	20.0464	20.0603	20.0601	20.0168	19.7391	19.2195	18.7491 (90)	
Living area fraction										fLA = Living area / (4) =			0.4588 (91)
MIT	19.3097	19.5167	19.8151	20.1509	20.3774	20.4720	20.4891	20.4876	20.4390	20.1655	19.6860	19.2604 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.3097	19.5167	19.8151	20.1509	20.3774	20.4720	20.4891	20.4876	20.4390	20.1655	19.6860	19.2604 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9600	0.9398	0.9009	0.8204	0.6812	0.4981	0.3511	0.3903	0.6135	0.8412	0.9368	0.9657 (94)
Useful gains	444.9026	479.5884	493.1817	475.5822	409.7895	292.6384	197.1603	206.3574	307.1812	393.0992	416.1065	428.3195 (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	780.5121	758.7511	690.0039	578.3402	445.3761	299.2533	198.1972	208.0419	323.9398	490.9588	647.9774	777.8545 (97)
Space heating kWh	249.6935	187.5974	146.4357	73.9858	26.4765	0.0000	0.0000	0.0000	0.0000	72.8076	166.9470	260.0540 (98a)
Space heating requirement - total per year (kWh/year)												1183.9974
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	249.6935	187.5974	146.4357	73.9858	26.4765	0.0000	0.0000	0.0000	0.0000	72.8076	166.9470	260.0540 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1183.9974
Space heating per m2										(98c) / (4) =		23.8229 (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 %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	249.6935	187.5974	146.4357	73.9858	26.4765	0.0000	0.0000	0.0000	0.0000	72.8076	166.9470	260.0540 (98)	
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)	
Space heating fuel (main heating system)	249.6935	187.5974	146.4357	73.9858	26.4765	0.0000	0.0000	0.0000	0.0000	72.8076	166.9470	260.0540 (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	173.1408	135.3647	114.8552	60.8891	25.1472	8.2495	6.9024	31.5819	61.3488	109.1558	145.1501	173.7690 (64)	
Efficiency of water heater	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)	
Fuel for water heating, kWh/month	173.1408	135.3647	114.8552	60.8891	25.1472	8.2495	6.9024	31.5819	61.3488	109.1558	145.1501	173.7690 (219)	
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)	
Lighting	18.9190	15.1775	13.6657	10.0121	7.7336	6.3184	7.0549	9.1702	11.9111	15.6281	17.6519	19.4448 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-35.8814	-51.6964	-73.6695	-77.5968	-74.9457	-63.2485	-62.4459	-59.8022	-54.6470	-54.2457	-39.0996	-30.9501 (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)	1.6088	1.3727	-2.3045	-12.9326	-27.7381	-34.5811	-34.1167	-28.6464	-20.7338	-5.1018	0.7632	1.5315 (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													1183.9974 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													100.0000
Water heating fuel used													1045.5544 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year													0.0000 (231)
Electricity for lighting (calculated in Appendix L)													152.6873 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-839.1076 (233)
Wind generation													0.0000 (234)

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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	1543.1315 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1 (high-rate cost)	1183.9974	19.6000	232.0635	(240)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (electric off-peak tariff)				
High-rate fraction			0.0325	(243)
Low-rate fraction			0.9675	(244)
High-rate cost	34.0034	19.6000	6.6647	(245)
Low-rate cost	1011.5509	9.4000	95.0858	(246)
Energy for instantaneous electric shower(s)	0.0000	18.5800	0.0000	(247a)
Pumps, fans and electric keep-hot (0.90*19.60 + 0.10*9.40)	0.0000	0.0000	0.0000	(249)
Energy for lighting (0.90*19.60 + 0.10*9.40)	152.6873	18.5800	28.3693	(250)
Additional standing charges			7.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-678.2288	18.5800	-126.0149	
PV Unit electricity exported	-160.8789	5.5900	-8.9931	
Total			-135.0080	(252)
Total energy cost			234.1752	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.8902 (257)
SAP value		85.5697
SAP rating (Section 12)		86 (258)
SAP band		B

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 (high-rate cost)	1183.9974	0.1637	193.8001	(261)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating - high rate cost	34.0034	0.1579	5.3700	(264)
Water heating - low rate cost	1011.5509	0.1326	134.0925	(264)
Space and water heating			333.2626	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	152.6873	0.1490	22.7534	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-678.2288	0.1409	-95.5923	
PV Unit electricity exported	-160.8789	0.1082	-17.4066	
Total			-112.9989	(269)
Total CO2, kg/year			243.0172	(272)
CO2 emissions per m2			4.8900	(273)
EI value			96.5613	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

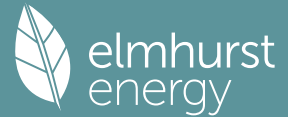
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling	49.7000 (1b)	x 2.4000 (2b)	= 119.2800 (1b) - (3b)	
Ground floor				
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.7000		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	119.2800 (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)

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Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 20.0000 / (5) = 0.1677 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 3.0000 (17)
Infiltration rate 0.3177 (18)
Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.2700 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	3.8000	3.5000	3.7000	3.4000	3.5000	3.0000	3.1000	3.0000	3.0000	3.2000	3.1000	3.5000 (22)
Adj infilt rate	0.9500	0.8750	0.9250	0.8500	0.8750	0.7500	0.7750	0.7500	0.7500	0.8000	0.7750	0.8750 (22a)
Effective ac	0.2565	0.2363	0.2498	0.2295	0.2363	0.2025	0.2093	0.2025	0.2025	0.2160	0.2093	0.2363 (22b)
	0.5329	0.5279	0.5312	0.5263	0.5279	0.5205	0.5219	0.5205	0.5205	0.5233	0.5219	0.5279 (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							
Ent Door			1.9600	1.2000	2.3520		(26a)
Windows			7.8300	1.1450	8.9656		(27)
Heatloss Floor 1			49.7000	0.1200	5.9640	75.0000	3727.5000 (28a)
External Wall 1	35.7600	9.7900	25.9700	0.2000	5.1940	60.0000	1558.2000 (29a)
Total net area of external elements Aum (A, m2)			85.4600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.4756		(33)
Main dwelling							
Party Wall 1			36.9600	0.0000	0.0000	70.0000	2587.2000 (32)
Party Ceiling 1			49.7000			30.0000	1491.0000 (32b)
Internal Wall 1			69.1200			9.0000	622.0800 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9985.9800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 200.9252 (35)

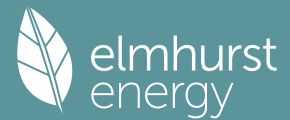
List of Thermal Bridges	Length	Psi-value	Total
K1 Element	5.7300	0.0480	0.2750
E2 Other lintels (including other steel lintels)	4.8000	0.0450	0.2160
E3 Sill	13.8000	0.0510	0.7038
E4 Jamb	14.9000	0.0640	0.9536
E5 Ground floor (normal)	2.4000	0.0570	0.1368
E16 Corner (normal)	4.8000	0.0620	0.2976
E18 Party wall between dwellings	15.4000	0.3200	4.9280
P1 Party wall - Ground floor			7.5108 (36)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			0.0000
Point Thermal bridges			(36a) =
Total fabric heat loss			(33) + (36) + (36a) = 29.9865 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	20.9763	20.7799	20.9090	20.7180	20.7799	20.4884	20.5431	20.4884	20.4884	20.5996	20.5431	20.7799 (38)
Heat transfer coeff	50.9628	50.7664	50.8955	50.7045	50.7664	50.4749	50.5296	50.4749	50.4749	50.5861	50.5296	50.7664 (39)
Average = Sum(39)m / 12 =												50.6610
HLP	1.0254	1.0215	1.0241	1.0202	1.0215	1.0156	1.0167	1.0156	1.0156	1.0178	1.0167	1.0215 (40)
HLP (average)												1.0193
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6813 (42)
Hot water usage for mixer showers	52.4089	51.6213	50.4736	48.2777	46.6572	44.8500	43.8228	44.9618	46.2103	48.1507	50.3938	52.2081 (42a)	
Hot water usage for baths	22.6608	22.3242	21.8503	20.9765	20.3221	19.5966	19.2047	19.6753	20.1877	20.9641	21.8559	22.5842 (42b)	
Hot water usage for other uses	31.8479	30.6898	29.5317	28.3736	27.2155	26.0574	26.0574	27.2155	28.3736	29.5317	30.6898	31.8479 (42c)	
Average daily hot water use (litres/day)												98.2820 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	106.9176	104.6353	101.8556	97.6277	94.1948	90.5040	89.0849	91.8526	94.7717	98.6465	102.9395	106.6401 (44)	
Energy content (annual)	169.3313	148.9993	156.5482	133.6475	126.8043	111.2852	107.7404	113.7327	116.8629	133.8623	146.6562	166.9727 (45)	
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1632.4430	
Water storage loss:	25.3997	22.3499	23.4822	20.0471	19.0206	16.6928	16.1611	17.0599	17.5294	20.0794	21.9984	25.0459 (46)	
Store volume												201.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												0.9700 (48)	
Temperature factor from Table 2b												0.6000 (49)	
Enter (49) or (54) in (55)												0.5820 (55)	
Total storage loss	18.0420	16.2960	18.0420	17.4600	18.0420	17.4600	18.0420	18.0420	17.4600	18.0420	17.4600	18.0420 (56)	
If cylinder contains dedicated solar storage	18.0420	16.2960	18.0420	17.4600	18.0420	17.4600	18.0420	18.0420	17.4600	18.0420	17.4600	18.0420 (57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	
Total heat required for water heating calculated for each month	187.3733	165.2953	174.5902	151.1075	144.8463	128.7452	125.7824	131.7747	134.3229	151.9043	164.1162	185.0147 (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	-18.2038	-31.7387	-62.7437	-96.6514	-123.3095	-133.2563	-130.5656	-113.5545	-82.3470	-49.7651	-23.6989	-14.5142 (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	169.1695	133.5566	111.8465	54.4561	21.5368	0.0000	0.0000	18.2202	51.9760	102.1392	140.4173	170.5005 (64)	
Electric shower(s)								Total per year (kWh/year) = Sum(64)m =				973.8187 (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	56.3026	49.5423	52.0523	44.4378	42.1624	37.0023	35.8237	37.8161	38.8569	44.5092	48.7632	55.5184 (65)	

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.6145	19.1978	15.6127	11.8198	8.8354	7.4593	8.0600	10.4767	14.0618	17.8547	20.8390	22.2152 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	218.5892	220.8575	215.1415	202.9729	187.6122	173.1753	163.5306	161.2623	166.9783	179.1469	194.5076	208.9445 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689 (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)	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509 (71)
Water heating gains (Table 5)	75.6756	73.7236	69.9627	61.7192	56.6699	51.3921	48.1501	50.8281	53.9680	59.8242	67.7266	74.6215 (72)
Total internal gains	396.2737	394.1732	381.1113	356.9062	333.5119	312.4210	300.1350	302.9614	315.4023	337.2201	363.4676	386.1756 (73)

6. Solar gains

[Jan]	Area m ²		Solar flux Table 6a W/m ²		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
North	5.4000		12.7650		0.5100		0.0000		0.7700		27.0693 (74)	
South	2.4300		54.2217		0.5100		0.0000		0.7700		51.7417 (78)	
Solar gains	78.8110	119.4621	171.0342	234.9149	275.6379	299.9299	283.2883	249.7302	202.3471	143.9472	93.3477	67.6488 (83)
Total gains	475.0846	513.6353	552.1455	591.8211	609.1499	612.3509	583.4233	552.6916	517.7494	481.1673	456.8153	453.8244 (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	54.4296	54.6402	54.5015	54.7069	54.6402	54.9557	54.8962	54.9557	54.9557	54.8349	54.8962	54.6402
alpha	4.6286	4.6427	4.6334	4.6471	4.6427	4.6637	4.6597	4.6637	4.6637	4.6557	4.6597	4.6427
util living area	0.9640	0.9473	0.9014	0.8055	0.6477	0.4316	0.2938	0.3186	0.5802	0.8270	0.9388	0.9700 (86)
MIT	20.0623	20.2115	20.4897	20.7605	20.9296	20.9916	20.9989	20.9985	20.9670	20.7695	20.3740	20.0097 (87)
Th 2	20.0622	20.0655	20.0633	20.0665	20.0655	20.0704	20.0694	20.0704	20.0704	20.0685	20.0694	20.0655 (88)
util rest of house	0.9557	0.9355	0.8797	0.7664	0.5876	0.3583	0.2137	0.2345	0.5023	0.7830	0.9229	0.9628 (89)
MIT 2	19.0065	19.1930	19.5286	19.8407	20.0116	20.0663	20.0692	20.0700	20.0504	19.8602	19.4003	18.9437 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.4909	19.6602	19.9695	20.2627	20.4327	20.4908	20.4957	20.4959	20.4709	20.2773	19.8470	19.4327 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.4909	19.6602	19.9695	20.2627	20.4327	20.4908	20.4957	20.4959	20.4709	20.2773	19.8470	19.4327 (93)

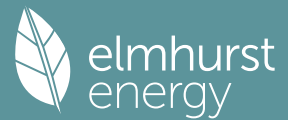
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9495	0.9295	0.8772	0.7752	0.6119	0.3917	0.2505	0.2731	0.5367	0.7936	0.9184	0.9569 (94)
Useful gains	451.0861	477.4063	484.3570	458.7549	372.7495	239.8830	146.1450	150.9578	277.8768	381.8697	419.5618	434.2643 (95)
Ext temp.	5.0000	5.5000	7.4000	9.8000	12.7000	15.7000	17.6000	17.5000	14.8000	11.4000	7.8000	4.9000 (96)
Heat loss rate W	738.4948	718.8636	639.7297	530.5059	392.5618	241.8135	146.3192	151.2184	286.2361	449.0692	608.7305	737.7716 (97)
Space heating kWh	213.8321	162.2593	115.5973	51.6607	14.7403	0.0000	0.0000	0.0000	0.0000	49.9964	136.2015	225.8095 (98a)
Space heating requirement - total per year (kWh/year)												970.0972
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	213.8321	162.2593	115.5973	51.6607	14.7403	0.0000	0.0000	0.0000	0.0000	49.9964	136.2015	225.8095 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												970.0972
Space heating per m ²												(98c) / (4) = 19.5191 (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 %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	213.8321	162.2593	115.5973	51.6607	14.7403	0.0000	0.0000	0.0000	0.0000	49.9964	136.2015	225.8095 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	213.8321	162.2593	115.5973	51.6607	14.7403	0.0000	0.0000	0.0000	0.0000	49.9964	136.2015	225.8095 (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												

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Water heating requirement	169.1695	133.5566	111.8465	54.4561	21.5368	0.0000	0.0000	18.2202	51.9760	102.1392	140.4173	170.5005 (64)
Efficiency of water heater	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (217)
Fuel for water heating, kWh/month	169.1695	133.5566	111.8465	54.4561	21.5368	0.0000	0.0000	18.2202	51.9760	102.1392	140.4173	170.5005 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	18.9190	15.1775	13.6657	10.0121	7.7336	6.3184	7.0549	9.1702	11.9111	15.6281	17.6519	19.4448 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-40.8559	-52.4455	-73.0118	-76.2438	-72.8005	-64.8341	-63.9154	-61.9066	-56.9387	-56.2233	-43.3823	-35.5822 (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	1.2828	0.4298	-5.0256	-17.6586	-31.4978	-38.2857	-37.5024	-32.5526	-23.4469	-8.2938	-0.1798	1.3918 (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												970.0972 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												100.0000
Water heating fuel used												973.8187 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												152.6873 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-889.4789 (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												1207.1243 (238)

10a. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1 (high-rate cost)	970.0972	34.6000	335.6536 (240)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (electric off-peak tariff)			
High-rate fraction			0.0325 (243)
Low-rate fraction			0.9675 (244)
High-rate cost	31.6705	34.6000	10.9580 (245)
Low-rate cost	942.1483	15.8000	148.8594 (246)
Energy for instantaneous electric shower(s)	0.0000	32.7200	0.0000 (247a)
Pumps, fans and electric keep-hot (0.90*34.60 + 0.10*15.80)	0.0000	0.0000	0.0000 (249)
Energy for lighting (0.90*34.60 + 0.10*15.80)	152.6873	32.7200	49.9593 (250)
Additional standing charges			8.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-698.1402	32.7200	-228.4315
PV Unit electricity exported	-191.3388	5.8100	-11.1168
Total			-239.5482 (252)
Total energy cost			313.8821 (255)

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 (high-rate cost)	970.0972	0.1644	159.5020 (261)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating - high rate cost	31.6705	0.1594	5.0495 (264)
Water heating - low rate cost	942.1483	0.1338	126.0926 (264)
Space and water heating			290.6441 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	152.6873	0.1490	22.7534 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-698.1402	0.1412	-98.5784
PV Unit electricity exported	-191.3388	0.1115	-21.3272
Total			-119.9056 (269)
Total CO2, kg/year			193.4920 (272)

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 (high-rate cost)	970.0972	1.6128	1564.5659 (275)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating - high rate cost	31.6705	1.5947	50.5041 (278)
Water heating - low rate cost	942.1483	1.4832	1397.3574 (278)
Space and water heating			3012.4274 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	152.6873	1.5547	237.3898 (282)

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Energy saving/generation technologies			
PV Unit electricity used in dwelling	-698.1402	1.5262	-1065.5147
PV Unit electricity exported	-191.3388	0.4085	-78.1631
Total			-1143.6778 (283)
Total Primary energy kWh/year			2106.1393 (286)

SAP 10 EPC IMPROVEMENTS

Grd Flr Flat elec

Current energy efficiency rating: B 86
Current environmental impact rating: A 97

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures: (none)	SAP change	Cost change	CO2 change
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Recommended measures (none)	Typical annual savings		Energy efficiency	Environmental impact
	Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 86
Potential environmental impact rating: A 97

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, South East England):

	Current £553	Potential £553	£0 Saving
Electricity			
Space heating	£344	£344	£0
Water heating	£160	£160	£0
Lighting	£50	£50	£0
Generated (PV)	-£240	-£240	£0
Total cost of fuels	£313	£313	£0
Total cost of uses	£314	£314	£0
Delivered energy	24 kWh/m²	24 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	4 kg/m²	4 kg/m²	0 kg/m²
Primary energy	42 kWh/m²	42 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m²)	Storey height (m)	Volume (m³)
Main dwelling	49.7000 (1b)	2.4000 (2b)	119.2800 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.7000		
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 119.2800 (5)

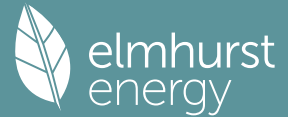
2. Ventilation rate

	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) =	0.1677 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50		3.0000 (17)
Infiltration rate		0.3177 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2700 (21)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

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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												
	0.3443	0.3375	0.3308	0.2970	0.2903	0.2565	0.2565	0.2498	0.2700	0.2903	0.3038	0.3173 (22b)
Effective ac	0.5593	0.5570	0.5547	0.5441	0.5421	0.5329	0.5329	0.5312	0.5365	0.5421	0.5461	0.5503 (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								
Ent Door			1.9600	1.2000	2.3520			(26a)
Windows			7.8300	1.1450	8.9656			(27)
Heatloss Floor 1			49.7000	0.1200	5.9640	75.0000	3727.5000	(28a)
External Wall 1	35.7600	9.7900	25.9700	0.2000	5.1940	60.0000	1558.2000	(29a)
Total net area of external elements Aum(A, m2)			85.4600					(31)
Fabric heat loss, W/K = Sum (A x U)					22.4756			(33)
Main dwelling								
Party Wall 1			36.9600	0.0000	0.0000	70.0000	2587.2000	(32)
Party Ceiling 1			49.7000			30.0000	1491.0000	(32b)
Internal Wall 1			69.1200			9.0000	622.0800	(32c)
Heat capacity Cm = Sum(A x k)							9985.9800	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							200.9252	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	5.7300	0.0480	0.2750	
E3 Sill	4.8000	0.0450	0.2160	
E4 Jamb	13.8000	0.0510	0.7038	
E5 Ground floor (normal)	14.9000	0.0640	0.9536	
E16 Corner (normal)	2.4000	0.0570	0.1368	
E18 Party wall between dwellings	4.8000	0.0620	0.2976	
P1 Party wall - Ground floor	15.4000	0.3200	4.9280	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				7.5108 (36)
Point Thermal bridges				0.0000
Total fabric heat loss				(33) + (36) + (36a) = 29.9865 (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	22.0140	21.9234	21.8346	21.4175	21.3395	20.9763	20.9763	20.9090	21.1162	21.3395	21.4974	21.6624	(38)
Heat transfer coeff	52.0004	51.9099	51.8211	51.4040	51.3260	50.9628	50.9628	50.8955	51.1027	51.3260	51.4838	51.6489	(39)
Average = Sum(39)m / 12 =												51.4037	
HLP	1.0463	1.0445	1.0427	1.0343	1.0327	1.0254	1.0254	1.0241	1.0282	1.0327	1.0359	1.0392	(40)
HLP (average)												1.0343	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

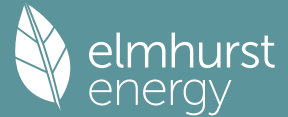
4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6813 (42)
Hot water usage for mixer showers													
52.4089	51.6213	50.4736	48.2777	46.6572	44.8500	43.8228	44.9618	46.2103	48.1507	50.3938	52.2081	(42a)	
Hot water usage for baths													
22.6608	22.3242	21.8503	20.9765	20.3221	19.5966	19.2047	19.6753	20.1877	20.9641	21.8559	22.5842	(42b)	
Hot water usage for other uses													
31.8479	30.6898	29.5317	28.3736	27.2155	26.0574	26.0574	27.2155	28.3736	29.5317	30.6898	31.8479	(42c)	
Average daily hot water use (litres/day)												98.2820	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
106.9176	104.6353	101.8556	97.6277	94.1948	90.5040	89.0849	91.8526	94.7717	98.6465	102.9395	106.6401	(44)	
Energy content (annual)	169.3313	148.9993	156.5482	133.6475	126.8043	111.2852	107.7404	113.7327	116.8629	133.8623	146.6562	166.9727	(45)
Distribution loss (46)m = 0.15 x (45)m										Total =	Sum(45)m =	1632.4430	
25.3997	22.3499	23.4822	20.0471	19.0206	16.6928	16.1611	17.0599	17.5294	20.0794	21.9984	25.0459	(46)	
Water storage loss:													
Store volume												201.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.9700	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.5820	(55)
Total storage loss													
18.0420	16.2960	18.0420	17.4600	18.0420	17.4600	18.0420	18.0420	17.4600	18.0420	17.4600	18.0420	(56)	
If cylinder contains dedicated solar storage													
18.0420	16.2960	18.0420	17.4600	18.0420	17.4600	18.0420	18.0420	17.4600	18.0420	17.4600	18.0420	(57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
187.3733	165.2953	174.5902	151.1075	144.8463	128.7452	125.7824	131.7747	134.3229	151.9043	164.1162	185.0147	(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	-14.2325	-29.9306	-59.7350	-90.2184	-119.6991	-120.4957	-118.8801	-100.1928	-72.9741	-42.7486	-18.9661	-11.2457	(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													
173.1408	135.3647	114.8552	60.8891	25.1472	8.2495	6.9024	31.5819	61.3488	109.1558	145.1501	173.7690	(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)	
Heat gains from water heating, kWh/month													
56.3026	49.5423	52.0523	44.4378	42.1624	37.0023	35.8237	37.8161	38.8569	44.5092	48.7632	55.5184	(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	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	21.6145	19.1978	15.6127	11.8198	8.8354	7.4593	8.0600	10.4767	14.0618	17.8547	20.8390	22.2152 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	218.5892	220.8575	215.1415	202.9729	187.6122	173.1753	163.5306	161.2623	166.9783	179.1469	194.5076	208.9445 (68)

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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689 (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 (70)
Losses e.g. evaporation (negative values) (Table 5)	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509 (71)
Water heating gains (Table 5)	75.6756	73.7236	69.9627	61.7192	56.6699	51.3921	48.1501	50.8281	53.9680	59.8242	67.7266 (72)
Total internal gains	396.2737	394.1732	381.1113	356.9062	333.5119	312.4210	300.1350	302.9614	315.4023	337.2201	363.4676 (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				5.4000	10.6334	0.5100		0.0000		0.7700		22.5490 (74)
South				2.4300	46.7521	0.5100		0.0000		0.7700		44.6137 (78)
Solar gains	67.1626	116.1579	166.2969	222.8092	268.0576	275.1069	261.4292	225.7334	185.2647	130.1039	80.6995	57.3482 (83)
Total gains	463.4363	510.3311	547.4083	579.7155	601.5696	587.5279	561.5642	528.6948	500.6670	467.3240	444.1671	443.5238 (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	53.3435	53.4365	53.5281	53.9624	54.0444	54.4296	54.4296	54.5015	54.2806	54.0444	53.8787	53.7066
alpha	4.5562	4.5624	4.5685	4.5975	4.6030	4.6286	4.6286	4.6334	4.6187	4.6030	4.5919	4.5804
util living area	0.9725	0.9562	0.9229	0.8490	0.7157	0.5383	0.3959	0.4371	0.6563	0.8715	0.9544	0.9768 (86)
MIT	19.9091	20.0914	20.3566	20.6601	20.8774	20.9741	20.9949	20.9921	20.9371	20.6686	20.2364	19.8637 (87)
Th 2	20.0449	20.0464	20.0479	20.0549	20.0562	20.0622	20.0622	20.0633	20.0599	20.0562	20.0535	20.0508 (88)
util rest of house	0.9661	0.9463	0.9057	0.8168	0.6622	0.4658	0.3132	0.3508	0.5828	0.8367	0.9424	0.9714 (89)
MIT 2	18.8017	19.0296	19.3562	19.7193	19.9536	20.0464	20.0603	20.0601	20.0168	19.7391	19.2195	18.7491 (90)
Living area fraction	19.3097	19.5167	19.8151	20.1509	20.3774	20.4720	20.4891	20.4876	20.4390	20.1655	19.6860	0.4588 (91)
MIT	19.3097	19.5167	19.8151	20.1509	20.3774	20.4720	20.4891	20.4876	20.4390	20.1655	19.6860	19.2604 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3097	19.5167	19.8151	20.1509	20.3774	20.4720	20.4891	20.4876	20.4390	20.1655	19.6860	19.2604 (93)

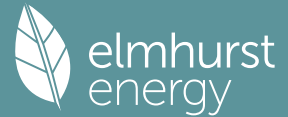
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9600	0.9398	0.9009	0.8204	0.6812	0.4981	0.3511	0.3903	0.6135	0.8412	0.9368	0.9657 (94)
Useful gains	444.9026	479.5884	493.1817	475.5822	409.7895	292.6384	197.1603	206.3574	307.1812	393.0992	416.1065	428.3195 (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	780.5121	758.7511	690.0039	578.3402	445.3761	299.2533	198.1972	208.0419	323.9398	490.9588	647.9774	777.8545 (97)
Space heating kWh	249.6935	187.5974	146.4357	73.9858	26.4765	0.0000	0.0000	0.0000	0.0000	72.8076	166.9470	260.0540 (98a)
Space heating requirement - total per year (kWh/year)												1183.9974
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	249.6935	187.5974	146.4357	73.9858	26.4765	0.0000	0.0000	0.0000	0.0000	72.8076	166.9470	260.0540 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1183.9974
Space heating per m2										(98c) / (4) =		23.8229 (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 %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	249.6935	187.5974	146.4357	73.9858	26.4765	0.0000	0.0000	0.0000	0.0000	72.8076	166.9470	260.0540 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	249.6935	187.5974	146.4357	73.9858	26.4765	0.0000	0.0000	0.0000	0.0000	72.8076	166.9470	260.0540 (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	173.1408	135.3647	114.8552	60.8891	25.1472	8.2495	6.9024	31.5819	61.3488	109.1558	145.1501	173.7690 (64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month	173.1408	135.3647	114.8552	60.8891	25.1472	8.2495	6.9024	31.5819	61.3488	109.1558	145.1501	173.7690 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	18.9190	15.1775	13.6657	10.0121	7.7336	6.3184	7.0549	9.1702	11.9111	15.6281	17.6519	19.4448 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-35.8814	-51.6964	-73.6695	-77.5968	-74.9457	-63.2485	-62.4459	-59.8022	-54.6470	-54.2457	-39.0996	-30.9501 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												

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(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	1.6088	1.3727	-2.3045	-12.9326	-27.7381	-34.5811	-34.1167	-28.6464	-20.7338	-5.1018	0.7632	1.5315	(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												1183.9974	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												100.0000	
Water heating fuel used												1045.5544	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												152.6873	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-839.1076	(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												1543.1315	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1 (high-rate cost)	1183.9974	19.6000	232.0635	(240)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (electric off-peak tariff)				
High-rate fraction			0.0325	(243)
Low-rate fraction			0.9675	(244)
High-rate cost	34.0034	19.6000	6.6647	(245)
Low-rate cost	1011.5509	9.4000	95.0858	(246)
Energy for instantaneous electric shower(s)	0.0000	18.5800	0.0000	(247a)
Pumps, fans and electric keep-hot (0.90*19.60 + 0.10*9.40)	0.0000	0.0000	0.0000	(249)
Energy for lighting (0.90*19.60 + 0.10*9.40)	152.6873	18.5800	28.3693	(250)
Additional standing charges			7.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-678.2288	18.5800	-126.0149	
PV Unit electricity exported	-160.8789	5.5900	-8.9931	
Total			-135.0080	(252)
Total energy cost			234.1752	(255)

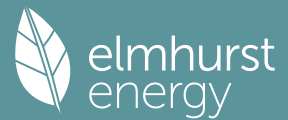
11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600	(256)
Energy cost factor (ECF)	0.8902	(257)
SAP value	85.5697	
SAP rating (Section 12)	86	(258)
SAP band	B	

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 (high-rate cost)	1183.9974	0.1637	193.8001	(261)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating - high rate cost	34.0034	0.1579	5.3700	(264)
Water heating - low rate cost	1011.5509	0.1326	134.0925	(264)
Space and water heating			333.2626	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	152.6873	0.1490	22.7534	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-678.2288	0.1409	-95.5923	
PV Unit electricity exported	-160.8789	0.1082	-17.4066	
Total			-112.9989	(269)
Total CO2, kg/year			243.0172	(272)
CO2 emissions per m2			4.8900	(273)
EI value			96.5613	
EI rating			97	(274)
EI band			A	

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1. Overall dwelling characteristics

Main dwelling	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	49.7000	2.4000	119.2800
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.7000		
Dwelling volume			

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	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) =	0.1677 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			3.0000 (17)
Infiltration rate			0.3177 (18)
Number of sides sheltered			2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.2700 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	3.8000	3.5000	3.7000	3.4000	3.5000	3.0000	3.1000	3.0000	3.0000	3.2000	3.1000	3.5000 (22)
Wind factor	0.9500	0.8750	0.9250	0.8500	0.8750	0.7500	0.7750	0.7500	0.7500	0.8000	0.7750	0.8750 (22a)
Adj infilt rate												
Effective ac	0.2565	0.2363	0.2498	0.2295	0.2363	0.2025	0.2093	0.2025	0.2025	0.2160	0.2093	0.2363 (22b)
	0.5329	0.5279	0.5312	0.5263	0.5279	0.5205	0.5219	0.5205	0.5205	0.5233	0.5219	0.5279 (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							
Ent Door			1.9600	1.2000	2.3520		(26a)
Windows			7.8300	1.1450	8.9656		(27)
Heatloss Floor 1			49.7000	0.1200	5.9640	75.0000	3727.5000 (28a)
External Wall 1	35.7600	9.7900	25.9700	0.2000	5.1940	60.0000	1558.2000 (29a)
Total net area of external elements Aum(A, m ²)			85.4600				(31)
Fabric heat loss, W/K = Sum (A x U)					22.4756		(33)
Main dwelling							
Party Wall 1			36.9600	0.0000	0.0000	70.0000	2587.2000 (32)
Party Ceiling 1			49.7000			30.0000	1491.0000 (32b)
Internal Wall 1			69.1200			9.0000	622.0800 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9985.9800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		200.9252 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	5.7300	0.0480	0.2750
E2 Other lintels (including other steel lintels)	4.8000	0.0450	0.2160
E3 Sill	13.8000	0.0510	0.7038
E4 Jamb	14.9000	0.0640	0.9536
E5 Ground floor (normal)	2.4000	0.0570	0.1368
E16 Corner (normal)	4.8000	0.0620	0.2976
E18 Party wall between dwellings	15.4000	0.3200	4.9280
P1 Party wall - Ground floor			

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		7.5108 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	29.9865 (37)

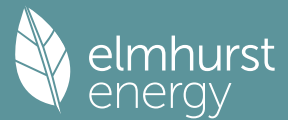
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	20.9763	20.7799	20.9090	20.7180	20.7799	20.4884	20.5431	20.4884	20.4884	20.5996	20.5431	20.7799 (38)
Average = Sum(39)m / 12 =	50.9628	50.7664	50.8955	50.7045	50.7664	50.4749	50.5296	50.4749	50.4749	50.5861	50.5296	50.7664 (39)
												50.6610

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0254	1.0215	1.0241	1.0202	1.0215	1.0156	1.0167	1.0156	1.0156	1.0178	1.0167	1.0215 (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												1.6813 (42)
Hot water usage for mixer showers												
Hot water usage for baths	52.4089	51.6213	50.4736	48.2777	46.6572	44.8500	43.8228	44.9618	46.2103	48.1507	50.3938	52.2081 (42a)
Hot water usage for other uses	22.6608	22.3242	21.8503	20.9765	20.3221	19.5966	19.2047	19.6753	20.1877	20.9641	21.8559	22.5842 (42b)
Average daily hot water use (litres/day)	31.8479	30.6898	29.5317	28.3736	27.2155	26.0574	26.0574	27.2155	28.3736	29.5317	30.6898	31.8479 (42c)
												98.2820 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	106.9176	104.6353	101.8556	97.6277	94.1948	90.5040	89.0849	91.8526	94.7717	98.6465	102.9395	106.6401 (44)
	169.3313	148.9993	156.5482	133.6475	126.8043	111.2852	107.7404	113.7327	116.8629	133.8623	146.6562	166.9727 (45)

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Energy content (annual)											Total = Sum(45)m =		1632.4430
Distribution loss (46)m = 0.15 x (45)m													
25.3997	22.3499	23.4822	20.0471	19.0206	16.6928	16.1611	17.0599	17.5294	20.0794	21.9984	25.0459	(46)	
Water storage loss:													
Store volume												201.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):													
Temperature factor from Table 2b												0.9700	(48)
Enter (49) or (54) in (55)												0.6000	(49)
Total storage loss												0.5820	(55)
18.0420	16.2960	18.0420	17.4600	18.0420	17.4600	18.0420	18.0420	17.4600	18.0420	17.4600	18.0420	(56)	
If cylinder contains dedicated solar storage													
18.0420	16.2960	18.0420	17.4600	18.0420	17.4600	18.0420	18.0420	17.4600	18.0420	17.4600	18.0420	(57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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													
187.3733	165.2953	174.5902	151.1075	144.8463	128.7452	125.7824	131.7747	134.3229	151.9043	164.1162	185.0147	(62)	
WWHRS	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	-18.2038	-31.7387	-62.7437	-96.6514	-123.3095	-133.2563	-130.5656	-113.5545	-82.3470	-49.7651	-23.6989	(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													
169.1695	133.5566	111.8465	54.4561	21.5368	0.0000	0.0000	18.2202	51.9760	102.1392	140.4173	170.5005	(64)	
Total per year (kWh/year) = Sum(64)m =												973.8187	(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													
56.3026	49.5423	52.0523	44.4378	42.1624	37.0023	35.8237	37.8161	38.8569	44.5092	48.7632	55.5184	(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	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763	100.8763	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	21.6145	19.1978	15.6127	11.8198	8.8354	7.4593	8.0600	10.4767	14.0618	17.8547	20.8390	22.2152	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	218.5892	220.8575	215.1415	202.9729	187.6122	173.1753	163.5306	161.2623	166.9783	179.1469	194.5076	208.9445	(68)
Pumps, fans	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689	46.7689	(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)
Water heating gains (Table 5)	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	-67.2509	(71)
Total internal gains	75.6756	73.7236	69.9627	61.7192	56.6699	51.3921	48.1501	50.8281	53.9680	59.8242	67.7266	74.6215	(72)
	396.2737	394.1732	381.1113	356.9062	333.5119	312.4210	300.1350	302.9614	315.4023	337.2201	363.4676	386.1756	(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			5.4000		12.7650		0.5100		0.0000		0.7700	27.0693 (74)	
South			2.4300		54.2217		0.5100		0.0000		0.7700	51.7417 (78)	

Solar gains	78.8110	119.4621	171.0342	234.9149	275.6379	299.9299	283.2883	249.7302	202.3471	143.9472	93.3477	67.6488 (83)	
Total gains	475.0846	513.6353	552.1455	591.8211	609.1499	612.3509	583.4233	552.6916	517.7494	481.1673	456.8153	453.8244 (84)	

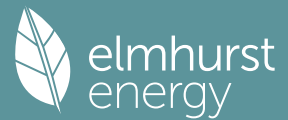
7. Mean internal temperature (heating season)													

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)												21.0000 (85)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	54.4296	54.6402	54.5015	54.7069	54.6402	54.9557	54.8962	54.9557	54.9557	54.8349	54.8962	54.6402	
alpha	4.6286	4.6427	4.6334	4.6471	4.6427	4.6637	4.6597	4.6637	4.6637	4.6557	4.6597	4.6427	
util living area	0.9640	0.9473	0.9014	0.8055	0.6477	0.4316	0.2938	0.3186	0.5802	0.8270	0.9388	0.9700 (86)	
MIT	20.0623	20.2115	20.4897	20.7605	20.9296	20.9916	20.9989	20.9985	20.9670	20.7695	20.3740	20.0097 (87)	
Th 2	20.0622	20.0655	20.0633	20.0665	20.0655	20.0704	20.0694	20.0704	20.0704	20.0685	20.0694	20.0655 (88)	
util rest of house	0.9557	0.9355	0.8797	0.7664	0.5876	0.3583	0.2137	0.2345	0.5023	0.7830	0.9229	0.9628 (89)	
MIT 2	19.0065	19.1930	19.5286	19.8407	20.0116	20.0663	20.0692	20.0700	20.0504	19.8602	19.4003	18.9437 (90)	
Living area fraction	19.4909	19.6602	19.9695	20.2627	20.4327	20.4908	20.4957	20.4959	fLA = Living area / (4) =	20.2773	19.8470	0.4588 (91)	
Temperature adjustment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	20.4709	20.2773	19.8470	19.4327 (92)	
adjusted MIT	19.4909	19.6602	19.9695	20.2627	20.4327	20.4908	20.4957	20.4959	20.4709	20.2773	19.8470	19.4327 (93)	

8. Space heating requirement													

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9495	0.9295	0.8772	0.7752	0.6119	0.3917	0.2505	0.2731	0.5367	0.7936	0.9184	0.9569 (94)	
Ext temp.	451.0861	477.4063	484.3570	458.7549	372.7495	239.8830	146.1450	150.9578	277.8768	381.8697	419.5618	434.2643 (95)	
Heat loss rate W	5.0000	5.5000	7.4000	9.8000	12.7000	15.7000	17.6000	17.5000	14.8000	11.4000	7.8000	4.9000 (96)	
Space heating kWh	738.4948	718.8636	639.7297	530.5059	392.5618	241.8135	146.3192	151.2184	286.2361	449.0692	608.7305	737.7716 (97)	
Space heating requirement - total per year (kWh/year)	213.8321	162.2593	115.5973	51.6607	14.7403	0.0000	0.0000	0.0000	0.0000	49.9964	136.2015	225.8095 (98a)	
Solar heating kWh	970.0972												
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	0.0000												
Space heating requirement after solar contribution - total per year (kWh/year)	213.8321	162.2593	115.5973	51.6607	14.7403	0.0000	0.0000	0.0000	0.0000	49.9964	136.2015	225.8095 (98c)	
	970.0972												

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Space heating per m2

(98c) / (4) = 19.5191 (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 %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	213.8321	162.2593	115.5973	51.6607	14.7403	0.0000	0.0000	0.0000	0.0000	49.9964	136.2015	225.8095 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	213.8321	162.2593	115.5973	51.6607	14.7403	0.0000	0.0000	0.0000	0.0000	49.9964	136.2015	225.8095 (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	169.1695	133.5566	111.8465	54.4561	21.5368	0.0000	0.0000	18.2202	51.9760	102.1392	140.4173	170.5005 (64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month	169.1695	133.5566	111.8465	54.4561	21.5368	0.0000	0.0000	18.2202	51.9760	102.1392	140.4173	170.5005 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	18.9190	15.1775	13.6657	10.0121	7.7336	6.3184	7.0549	9.1702	11.9111	15.6281	17.6519	19.4448 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-40.8559	-52.4455	-73.0118	-76.2438	-72.8005	-64.8341	-63.9154	-61.9066	-56.9387	-56.2233	-43.3823	-35.5822 (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	1.2828	0.4298	-5.0256	-17.6586	-31.4978	-38.2857	-37.5024	-32.5526	-23.4469	-8.2938	-0.1798	1.3918 (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												970.0972 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												100.0000
Water heating fuel used												973.8187 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												152.6873 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-889.4789 (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												1207.1243 (238)

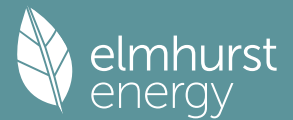
10a. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1 (high-rate cost)	970.0972	34.6000	335.6536 (240)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (electric off-peak tariff)			
High-rate fraction			0.0325 (243)
Low-rate fraction			0.9675 (244)
High-rate cost	31.6705	34.6000	10.9580 (245)
Low-rate cost	942.1483	15.8000	148.8594 (246)
Energy for instantaneous electric shower(s)	0.0000	32.7200	0.0000 (247a)
Pumps, fans and electric keep-hot (0.90*34.60 + 0.10*15.80)	0.0000	0.0000	0.0000 (249)
Energy for lighting (0.90*34.60 + 0.10*15.80)	152.6873	32.7200	49.9593 (250)
Additional standing charges			8.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-698.1402	32.7200	-228.4315
PV Unit electricity exported	-191.3388	5.8100	-11.1168
Total			-239.5482 (252)
Total energy cost			313.8821 (255)

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 (high-rate cost)	970.0972	0.1644	159.5020 (261)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (261)

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Total CO2 associated with community systems			0.0000 (373)
Water heating - high rate cost	31.6705	0.1594	5.0495 (264)
Water heating - low rate cost	942.1483	0.1338	126.0926 (264)
Space and water heating			290.6441 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	152.6873	0.1490	22.7534 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-698.1402	0.1412	-98.5784
PV Unit electricity exported	-191.3388	0.1115	-21.3272
Total			-119.9056 (269)
Total CO2, kg/year			193.4920 (272)

----- 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 (high-rate cost)	970.0972	1.6128	1564.5659 (275)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating - high rate cost	31.6705	1.5947	50.5041 (278)
Water heating - low rate cost	942.1483	1.4832	1397.3574 (278)
Space and water heating			3012.4274 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	152.6873	1.5547	237.3898 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-698.1402	1.5262	-1065.5147
PV Unit electricity exported	-191.3388	0.4085	-78.1631
Total			-1143.6778 (283)
Total Primary energy kWh/year			2106.1393 (286)

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Property Reference	P3 Ladds			Issued on Date	27/08/2025
Assessment Reference	1st Fir Flat edle	Prop Type Ref	Semi		
Property	1, Bath Road, Hare Hatch, Berkshire, RG10 9SA				
SAP Rating	80 C	DER	5.43	TER	11.57
Environmental	96 A	% DER < TER			53.07
CO ₂ Emissions (t/year)	0.28	DFEE	32.50	TFEE	31.61
Compliance Check	See BREL	% DFEE < TFEE			-2.80
% DPER < TPER	9.06	DPER	55.06	TPER	60.55
Assessor Details	Mrs. Naomi Sadler			Assessor ID	4611-0001
Client	Westbourne Homes, Westbourne Homes				

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	6.0000 (1b)	x 2.4000 (2b)	= 14.4000 (1b) - (3b)
First floor	57.7000 (1c)	x 2.4000 (2c)	= 138.4800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 152.8800 (5)

2. Ventilation rate

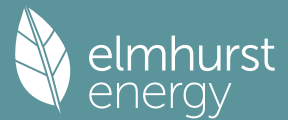
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	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) = 0.1308 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2808 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2387 (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	0.3043	0.2984	0.2924	0.2626	0.2566	0.2268	0.2268	0.2208	0.2387	0.2566	0.2685	0.2805 (22b)
Effective ac	0.5463	0.5445	0.5428	0.5345	0.5329	0.5257	0.5257	0.5244	0.5285	0.5329	0.5361	0.5393 (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							
Ent Door			1.9600	1.1000	2.1560		(26a)
Windows			8.1000	1.0536	8.5345		(27)
Heatloss Floor 1			6.0000	0.1200	0.7200	75.0000	450.0000 (28a)
External Wall 1	66.7200	10.0600	56.6600	0.2000	11.3320	60.0000	3399.6000 (29a)
Planned Roof	57.7000		57.7000	0.0900	5.1930	9.0000	519.3000 (30)
Total net area of external elements Aum(A, m ²)			130.4200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.9355		(33)
Main dwelling							
Party Wall 1			36.9600	0.0000	0.0000	70.0000	2587.2000 (32)
Party Floor 1			49.7000			30.0000	1491.0000 (32d)
Internal Wall 1			113.7600			9.0000	1023.8400 (32c)
Internal Floor 1			6.0000			18.0000	108.0000 (32d)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9578.9400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							150.3758 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E16 Corner (normal)				7.2000	0.0570	0.4104	
P1 Party wall - Ground floor				6.0000	0.3200	1.9200	

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E2 Other lintels (including other steel lintels)	6.9300	0.0480	0.3326
E3 Sill	6.0000	0.0450	0.2700
E4 Jamb	15.0000	0.0510	0.7650
E6 Intermediate floor within a dwelling	6.1000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	21.7000	0.0640	1.3888
E18 Party wall between dwellings	9.6000	0.0620	0.5952
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.4000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	9.4000	0.4800	4.5120
E10 Eaves (insulation at ceiling level)	21.7000	0.0840	1.8228
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			12.0168 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	39.9523 (37)

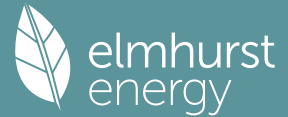
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	27.5616	27.4709	27.3820	26.9643	26.8861	26.5223	26.5223	26.4549	26.6625	26.8861	27.0442	27.2095 (38)
Average = Sum(39)m / 12 =	67.5140	67.4232	67.3343	66.9166	66.8384	66.4746	66.4746	66.4073	66.6148	66.8384	66.9965	67.1618 (39)
												66.9162
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0599	1.0584	1.0571	1.0505	1.0493	1.0436	1.0436	1.0425	1.0458	1.0493	1.0518	1.0543 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	1.0505
												31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.0841 (42)
Hot water usage for mixer showers												
	57.6681	56.7852	55.4841	53.4825	51.6891	49.1801	47.1957	49.5156	50.6824	53.1674	55.7553	57.6161 (42a)
Hot water usage for baths	24.9953	24.6180	24.0812	23.2773	22.5529	21.5556	20.7990	21.7242	22.2097	23.1979	24.2253	24.9754 (42b)
Hot water usage for other uses	35.9731	34.6650	33.3569	32.0488	30.7407	29.4325	29.4325	30.7407	32.0488	33.3569	34.6650	35.9731 (42c)
Average daily hot water use (litres/day)												109.0449 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	118.6365	116.0682	112.9221	108.8086	104.9826	100.1683	97.4272	101.9804	104.9409	109.7222	114.6456	118.5647 (44)
Energy conte	174.6534	153.5817	161.3634	142.1312	135.2807	115.8412	107.6600	120.0329	121.7262	141.3882	154.9474	174.1209 (45)
Energy content (annual)										Total = Sum(45)m =		1702.7271
Distribution loss (46)m = 0.15 x (45)m												
	26.1980	23.0373	24.2045	21.3197	20.2921	17.3762	16.1490	18.0049	18.2589	21.2082	23.2421	26.1181 (46)
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss												
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage												
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
	201.6048	177.9249	188.3148	168.2132	162.2321	141.9232	134.6114	146.9843	147.8082	168.3396	181.0294	201.0723 (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	-2.0808	-4.5647	-9.4867	-14.9101	-20.3861	-20.7584	-20.4820	-16.9790	-12.0069	-6.7007	-2.8278	-1.6308 (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	199.5240	173.3601	178.8282	153.3031	141.8460	121.1649	114.1294	130.0052	135.8014	161.6389	178.2015	199.4415 (64)
								Total per year (kWh/year) = Sum(64)m =				1887.2441 (64)
												1887 (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												
	58.0723	51.0659	53.6533	47.2586	44.9808	38.5172	35.7969	39.9109	40.4740	47.0116	51.5200	57.8952 (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	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	100.6872	111.4751	100.6872	104.0435	100.6872	104.0435	100.6872	100.6872	104.0435	100.6872	104.0435	100.6872 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	182.1728	184.0632	179.2995	169.1581	156.3565	144.3247	136.2868	134.3964	139.1601	149.3014	162.1031	174.1348 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204 (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)												
	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634 (71)
Water heating gains (Table 5)												
	78.0541	75.9909	72.1147	65.6370	60.4581	53.4961	48.1142	53.6437	56.2138	63.1876	71.5555	77.8161 (72)
Total internal gains	415.1754	425.7905	406.3627	393.0998	371.7631	356.1256	339.3494	342.9886	353.6787	367.4375	391.9634	406.8995 (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		4.0500		10.6334		0.5100		0.0000		0.7700		16.9117 (74)
South		4.0500		46.7521		0.5100		0.0000		0.7700		74.3561 (78)
Solar gains	91.2678	154.0953	210.0394	263.5333	301.5255	303.0306	290.5542	261.0554	228.0719	169.8188	109.0001	78.3490 (83)
Total gains	506.4432	579.8859	616.4021	656.6331	673.2885	659.1562	629.9036	604.0440	581.7505	537.2563	500.9635	485.2485 (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	39.4114	39.4644	39.5165	39.7632	39.8097	40.0275	40.0275	40.0682	39.9433	39.8097	39.7157	39.6180
alpha	3.6274	3.6310	3.6344	3.6509	3.6540	3.6685	3.6685	3.6712	3.6629	3.6540	3.6477	3.6412
util living area	0.9690	0.9494	0.9214	0.8587	0.7527	0.5927	0.4490	0.4844	0.6851	0.8732	0.9490	0.9731 (86)
MIT	19.3973	19.6529	19.9712	20.3796	20.7102	20.9121	20.9756	20.9674	20.8457	20.4295	19.8501	19.3459 (87)
Th 2	20.0337	20.0349	20.0361	20.0415	20.0425	20.0472	20.0472	20.0481	20.0454	20.0425	20.0404	20.0383 (88)
util rest of house	0.9632	0.9402	0.9066	0.8318	0.7059	0.5201	0.3581	0.3925	0.6170	0.8434	0.9381	0.9680 (89)
MIT 2	18.1783	18.4993	18.8963	19.3959	19.7757	19.9846	20.0355	20.0314	19.9251	19.4659	18.7552	18.1167 (90)
Living area fraction	fLA = Living area / (4) = 0.3187 (91)											
MIT	18.5668	18.8669	19.2389	19.7094	20.0735	20.2802	20.3351	20.3297	20.2185	19.7730	19.1041	18.5084 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.5668	18.8669	19.2389	19.7094	20.0735	20.2802	20.3351	20.3297	20.2185	19.7730	19.1041	18.5084 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9515	0.9261	0.8920	0.8212	0.7075	0.5386	0.3862	0.4205	0.6302	0.8337	0.9246	0.9571 (94)
Useful gains	481.8662	537.0349	549.8090	539.2495	476.3478	355.0220	243.2798	254.0172	366.6429	447.9110	463.1741	464.4182 (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	963.2055	941.6947	857.7635	723.3292	559.6724	377.5860	248.2886	260.9588	407.5820	613.1070	804.2343	960.9810 (97)
Space heating kWh	358.1164	271.9313	229.1182	132.5374	61.9935	0.0000	0.0000	0.0000	0.0000	122.9058	245.5633	369.4428 (98a)
Space heating requirement - total per year (kWh/year)	1791.6087											
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	358.1164	271.9313	229.1182	132.5374	61.9935	0.0000	0.0000	0.0000	0.0000	122.9058	245.5633	369.4428 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1791.6087											
Space heating per m2	(98c) / (4) = 28.1257 (99)											
9a. Energy requirements - Individual heating systems, including micro-CHP												
Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)											
Fraction of space heat from main system(s)	1.0000 (202)											
Fraction of main heating from main system 2	0.0000 (203)											
Fraction of total heating from main system 1	1.0000 (204)											
Fraction of total heating from main system 2	0.0000 (205)											
Efficiency of main space heating system 1 (in %)	100.0000 (206)											
Efficiency of main space heating system 2 (in %)	0.0000 (207)											
Efficiency of secondary/supplementary heating system, %	0.0000 (208)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	358.1164	271.9313	229.1182	132.5374	61.9935	0.0000	0.0000	0.0000	0.0000	122.9058	245.5633	369.4428 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	358.1164	271.9313	229.1182	132.5374	61.9935	0.0000	0.0000	0.0000	0.0000	122.9058	245.5633	369.4428 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Space heating fuel used, main system 2	0.0000 (213)											
Water heating												
Water heating requirement												
Efficiency of water heater (217)m	346.6091	346.6091	346.6091	346.6091	346.6091	346.6091	346.6091	346.6091	346.6091	346.6091	346.6091	346.6091 (216)
Fuel for water heating, kWh/month	57.5646	50.0160	51.5936	44.2294	40.9239	34.9572	32.9274	37.5077	39.1800	46.6343	51.4128	57.5408 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	24.6261	19.7560	17.7881	13.0323	10.0665	8.2244	9.1830	11.9364	15.5043	20.3424	22.9767	25.3105 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-11.8695	-18.5500	-29.2880	-35.4427	-39.2665	-34.8758	-34.4178	-31.3459	-26.3461	-21.7765	-13.5593	-10.0658 (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	0.4078	0.6374	0.6836	-0.4529	-2.8950	-5.7806	-5.7036	-4.7263	-3.3403	-0.1609	0.3636	0.3514 (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	1791.6087 (211)											
Space heating fuel - main system 2	0.0000 (213)											
Space heating fuel - secondary	0.0000 (215)											
Efficiency of water heater	346.6091											
Water heating fuel used	544.4877 (219)											
Space cooling fuel	0.0000 (221)											
Electricity for pumps and fans:												

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Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	198.7468 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-327.4197 (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	2207.4234 (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 (high-rate cost)	1791.6087	0.1629	291.7953 (261)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (261)
Space heating - main system 2 (high-rate cost)	0.0000	0.0000	0.0000 (262)
Space heating - main system 2 (low-rate cost)	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating - high rate cost	22.0417	0.1490	3.2842 (264)
Water heating - low rate cost	522.4460	0.1251	65.3355 (264)
Space and water heating			360.4151 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	198.7468	0.1490	29.6172 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-306.8039	0.1380	-42.3397
PV Unit electricity exported	-20.6158	0.0950	-1.9581
Total			-44.2977 (269)
Total CO2, kg/year			345.7346 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.4300 (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 (high-rate cost)	1791.6087	1.6072	2879.5287 (275)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (275)
Space heating - main system 2 (high-rate cost)	0.0000	0.0000	0.0000 (276)
Space heating - main system 2 (low-rate cost)	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating - high rate cost	22.0417	1.5569	34.3156 (278)
Water heating - low rate cost	522.4460	1.4479	756.4655 (278)
Space and water heating			3670.3098 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	198.7468	1.5547	309.0005 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-306.8039	1.5145	-464.6618
PV Unit electricity exported	-20.6158	0.3463	-7.1393
Total			-471.8011 (283)
Total Primary energy kWh/year			3507.5092 (286)
Dwelling Primary energy Rate (DPER)			55.0600 (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	6.0000 (1b)	x 2.4000 (2b)	= 14.4000 (1b) - (3b)
First floor	57.7000 (1c)	x 2.4000 (2c)	= 138.4800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 152.8800 (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) = 0.1308 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3808 (18)
Number of sides sheltered	2 (19)

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Shelter factor
Infiltration rate adjusted to include shelter factor

$$(20) = 1 - [0.075 \times (19)] = 0.8500 \quad (20)$$

$$(21) = (18) \times (20) = 0.3237 \quad (21)$$

	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	0.4127	0.4046	0.3965	0.3561	0.3480	0.3075	0.3075	0.2994	0.3237	0.3480	0.3642	0.3803	(22b)
Effective ac	0.5852	0.5819	0.5786	0.5634	0.5605	0.5473	0.5473	0.5448	0.5524	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 Semi-glazed door			1.9600	1.0000	1.9600			(26a)
TER Opening Type			8.1000	1.1450	9.2748			(27)
Heatloss Floor 1			6.0000	0.1300	0.7800			(28a)
External Wall 1	66.7200	10.0600	56.6600	0.1800	10.1988			(29a)
Planned Roof	57.7000		57.7000	0.1100	6.3470			(30)
Total net area of external elements Aum(A, m2)			130.4200					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	28.5606		(33)
Main dwelling								
Party Wall 1			36.9600	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							150.3758	(35)

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

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E16 Corner (normal)	7.2000	0.0900	0.6480	
P1 Party wall - Ground floor	6.0000	0.0800	0.4800	
E2 Other lintels (including other steel lintels)	6.9300	0.0500	0.3465	
E3 Sill	6.0000	0.0500	0.3000	
E4 Jamb	15.0000	0.0500	0.7500	
E6 Intermediate floor within a dwelling	6.1000	0.0000	0.0000	
E7 Party floor between dwellings (in blocks of flats)	21.7000	0.0700	1.5190	
E18 Party wall between dwellings	9.6000	0.0600	0.5760	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.4000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	9.4000	0.1200	1.1280	
E10 Eaves (insulation at ceiling level)	21.7000	0.0600	1.3020	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				7.0495 (36)
Point Thermal bridges				0.0000
Total fabric heat loss			(33) + (36) + (36a) =	35.6101 (37)

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

Point Thermal bridges

Total fabric heat loss

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	29.5219	29.3551	29.1915	28.4234	28.2796	27.6106	27.6106	27.4867	27.8683	28.2796	28.5704	28.8743	(38)
Heat transfer coeff	65.1320	64.9652	64.8016	64.0335	63.8898	63.2207	63.2207	63.0968	63.4784	63.8898	64.1805	64.4845	(39)
Average = Sum(39)m / 12 =												64.0328	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0225	1.0199	1.0173	1.0052	1.0030	0.9925	0.9925	0.9905	0.9965	1.0030	1.0075	1.0123	(40)
HLP (average)												1.0052	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0841 (42)
Hot water usage for mixer showers	59.1629	58.2737	56.9781	54.4993	52.6699	50.6298	49.4702	50.7560	52.1655	54.3559	56.8881	58.9362 (42a)
Hot water usage for baths	25.5652	25.1855	24.6508	23.6650	22.9268	22.1083	21.6662	22.1971	22.7752	23.6510	24.6572	25.4788 (42b)
Hot water usage for other uses	35.9731	34.6650	33.3569	32.0488	30.7407	29.4325	29.4325	30.7407	32.0488	33.3569	34.6650	35.9731 (42c)
Average daily hot water use (litres/day)												110.9520 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	120.7012	118.1243	114.9859	110.2130	106.3374	102.1707	100.5690	103.6938	106.9895	111.3639	116.2102	120.3880	(44)
Energy conte	191.1611	168.2074	176.7290	150.8761	143.1506	125.6308	121.6294	128.3946	131.9287	151.1197	165.5628	188.4986	(45)
Energy content (annual)										Total = Sum(45)m =		1842.8888	
Distribution loss (46)m = 0.15 x (45)m													
	28.6742	25.2311	26.5094	22.6314	21.4726	18.8446	18.2444	19.2592	19.7893	22.6680	24.8344	28.2748	(46)

Water storage loss:

Store volume

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

Temperature factor from Table 2b

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

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

237.7560	210.2931	223.3239	195.9680	189.7455	170.7226	168.2243	174.9895	177.0205	197.7146	210.6546	235.0935	(62)
WWHRS	-27.0468	-23.9204	-25.0481	-20.7408	-19.3297	-16.5405	-16.4871	-17.1135	-20.1749	-22.8557	-26.5459	(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

210.7092	186.3727	198.2759	175.2272	170.4158	154.1821	152.7202	158.5024	159.9071	177.5397	187.7989	208.5476	(64)
Total per year (kWh/year)											2140.1988	(64)
Electric shower(s)											2140	(64)

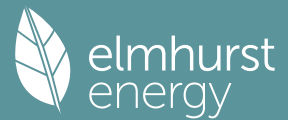
12Total per year (kWh/year)

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

Heat gains from water heating, kWh/month

100.8370	89.5975	96.0383	86.2398	84.8735	77.8457	77.7177	79.9671	79.9398	87.5232	91.1231	99.9517	(65)
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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	100.6872	111.4751	100.6872	104.0435	100.6872	104.0435	100.6872	100.6872	104.0435	100.6872	104.0435	100.6872 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	182.1728	184.0632	179.2995	169.1581	156.3565	144.3247	136.2868	134.3964	139.1601	149.3014	162.1031	174.1348 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204 (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)	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634 (71)
Water heating gains (Table 5)	135.5336	133.3296	129.0838	119.7775	114.0773	108.1190	104.4593	107.4827	111.0275	117.6387	126.5599	134.3437 (72)
Total internal gains	475.6549	486.1292	466.3317	450.2403	428.3822	410.7485	395.6946	396.8276	408.4923	424.8887	449.9677	466.4270 (73)

6. Solar gains

[Jan]	Area m ²		Solar flux Table 6a W/m ²		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
North	4.0500		10.6334		0.6300		0.7000		0.7700		13.1613 (74)	
South	4.0500		46.7521		0.6300		0.7000		0.7700		57.8666 (78)	
Solar gains	71.0279	119.9224	163.4601	205.0909	234.6578	235.8291	226.1195	203.1625	177.4936	132.1590	84.8278	60.9739 (83)
Total gains	546.6827	606.0517	629.7918	655.3313	663.0400	646.5776	621.8141	599.9901	585.9858	557.0476	534.7955	527.4010 (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	40.8527	40.9576	41.0610	41.5535	41.6470	42.0877	42.0877	42.1704	41.9169	41.6470	41.4583	41.2629
alpha	3.7235	3.7305	3.7374	3.7702	3.7765	3.8058	3.8058	3.8114	3.7945	3.7765	3.7639	3.7509
util living area	0.9601	0.9406	0.9130	0.8509	0.7453	0.5818	0.4355	0.4676	0.6643	0.8541	0.9360	0.9643 (86)
MIT	19.5686	19.7889	20.0714	20.4451	20.7442	20.9271	20.9811	20.9751	20.8752	20.5176	20.0002	19.5343 (87)
Th 2	20.0646	20.0668	20.0689	20.0790	20.0809	20.0896	20.0896	20.0912	20.0862	20.0809	20.0771	20.0731 (88)
util rest of house	0.9529	0.9302	0.8974	0.8238	0.6992	0.5122	0.3503	0.3817	0.5981	0.8224	0.9231	0.9579 (89)
MIT 2	18.4139	18.6902	19.0424	19.5019	19.8451	20.0374	20.0805	20.0784	19.9892	19.5966	18.9657	18.3768 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.7819	19.0403	19.3703	19.8025	20.1316	20.3210	20.3675	20.3641	20.2716	19.8901	19.2954	18.7457 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.7819	19.0403	19.3703	19.8025	20.1316	20.3210	20.3675	20.3641	20.2716	19.8901	19.2954	18.7457 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9403	0.9162	0.8835	0.8146	0.7019	0.5306	0.3769	0.4081	0.6123	0.8150	0.9098	0.9460 (94)
Useful gains	514.0448	555.2487	556.4138	533.8365	465.4060	343.0762	234.3344	244.8504	358.8003	453.9709	486.5412	498.9189 (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	943.2357	918.6276	834.0181	698.1257	538.6954	361.6835	238.1840	250.1244	391.7606	593.5410	782.7047	937.9695 (97)
Space heating kWh	319.3180	244.1907	206.5376	118.2883	54.5273	0.0000	0.0000	0.0000	0.0000	103.8402	213.2377	326.6537 (98a)
Space heating requirement - total per year (kWh/year)	1586.5934											
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	319.3180	244.1907	206.5376	118.2883	54.5273	0.0000	0.0000	0.0000	0.0000	103.8402	213.2377	326.6537 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1586.5934											
Space heating per m ²	(98c) / (4) = 24.9073 (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	319.3180	244.1907	206.5376	118.2883	54.5273	0.0000	0.0000	0.0000	0.0000	103.8402	213.2377	326.6537 (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)	345.9567	264.5619	223.7677	128.1563	59.0762	0.0000	0.0000	0.0000	0.0000	112.5029	231.0268	353.9043 (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	210.7092	186.3727	198.2759	175.2272	170.4158	154.1821	152.7202	158.5024	159.9071	177.5397	187.7989	208.5476 (64)
Efficiency of water heater	79.8000 (216)											
(217)m	84.9894	84.6667	84.1515	83.1982	81.8099	79.8000	79.8000	79.8000	79.8000	82.9007	84.3454	85.0618 (217)

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Fuel for water heating, kWh/month	247.9241	220.1251	235.6178	210.6141	208.3070	193.2106	191.3787	198.6246	200.3848	214.1595	222.6546	245.1718	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	20.9208	16.7835	15.1116	11.0714	8.5519	6.9870	7.8013	10.1405	13.1715	17.2817	19.5196	21.5023	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-30.0933	-42.5709	-61.4019	-69.2951	-74.9596	-70.0805	-69.2524	-65.2902	-58.2892	-48.8425	-33.1510	-26.0035	(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	-16.5414	-34.8579	-69.3866	-104.3520	-138.0960	-138.7705	-137.1002	-115.9930	-84.9270	-49.8504	-22.0882	-13.0726	(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												1718.9528	(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												2588.1728	(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)												168.8430	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1574.2660	(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												2987.7025	(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	1718.9528	0.2100	360.9801	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2588.1728	0.2100	543.5163	(264)
Space and water heating			904.4964	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	168.8430	0.1443	24.3693	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-649.2301	0.1345	-87.3223	
PV Unit electricity exported	-925.0360	0.1259	-116.4278	
Total			-203.7501	(269)
Total CO2, kg/year			737.0448	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.5700	(273)

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

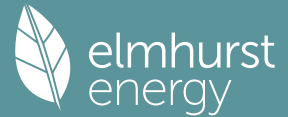
	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1718.9528	1.1300	1942.4167	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2588.1728	1.1300	2924.6353	(278)
Space and water heating			4867.0519	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	168.8430	1.5338	258.9770	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-649.2301	1.4971	-971.9555	
PV Unit electricity exported	-925.0360	0.4620	-427.3692	
Total			-1399.3246	(283)
Total Primary energy kWh/year			3856.8051	(286)
Target Primary Energy Rate (TPER)			60.5500	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	6.0000 (1b)	x 2.4000 (2b)	= 14.4000 (1b) - (3b)	
First floor	57.7000 (1c)	x 2.4000 (2c)	= 138.4800 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.7000			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 152.8800	(5)

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2. Ventilation rate

													m3 per hour
Number of open chimneys													0 * 80 = 0.0000 (6a)
Number of open flues													0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire													0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler													0 * 20 = 0.0000 (6d)
Number of flues attached to other heater													0 * 35 = 0.0000 (6e)
Number of blocked chimneys													0 * 20 = 0.0000 (6f)
Number of intermittent extract fans													2 * 10 = 20.0000 (7a)
Number of passive vents													0 * 10 = 0.0000 (7b)
Number of flueless gas fires													0 * 40 = 0.0000 (7c)
													Air changes per hour
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =												20.0000 / (5) = 0.1308 (8)
Pressure test													Yes
Pressure Test Method													Blower Door
Measured/design AP50													3.0000 (17)
Infiltration rate													0.2808 (18)
Number of sides sheltered													2 (19)
Shelter factor													(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor													(21) = (18) x (20) = 0.2387 (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)
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)
	0.3043	0.2984	0.2924	0.2626	0.2566	0.2268	0.2268	0.2208	0.2387	0.2566	0.2685	0.2805	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													0.0000 (23c)
Effective ac	0.5463	0.5445	0.5428	0.5345	0.5329	0.5257	0.5257	0.5244	0.5285	0.5329	0.5361	0.5393	(25)

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						
Ent Door			1.9600	1.1000	2.1560			(26a)					
Windows			8.1000	1.0536	8.5345			(27)					
Heatloss Floor 1			6.0000	0.1200	0.7200	75.0000	450.0000	(28a)					
External Wall 1	66.7200	10.0600	56.6600	0.2000	11.3320	60.0000	3399.6000	(29a)					
Planned Roof	57.7000		57.7000	0.0900	5.1930	9.0000	519.3000	(30)					
Total net area of external elements Aum(A, m2)			130.4200					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.9355			(33)					
Main dwelling													
Party Wall 1			36.9600	0.0000	0.0000	70.0000	2587.2000	(32)					
Party Floor 1			49.7000			30.0000	1491.0000	(32d)					
Internal Wall 1			113.7600			9.0000	1023.8400	(32c)					
Internal Floor 1			6.0000			18.0000	108.0000	(32d)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		9578.9400	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							150.3758	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
E16 Corner (normal)				7.2000	0.0570	0.4104							
P1 Party wall - Ground floor				6.0000	0.3200	1.9200							
E2 Other lintels (including other steel lintels)				6.9300	0.0480	0.3326							
E3 Sill				6.0000	0.0450	0.2700							
E4 Jamb				15.0000	0.0510	0.7650							
E6 Intermediate floor within a dwelling				6.1000	0.0000	0.0000							
E7 Party floor between dwellings (in blocks of flats)				21.7000	0.0640	1.3888							
E18 Party wall between dwellings				9.6000	0.0620	0.5952							
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				9.4000	0.0000	0.0000							
P4 Party wall - Roof (insulation at ceiling level)				9.4000	0.4800	4.5120							
E10 Eaves (insulation at ceiling level)				21.7000	0.0840	1.8228							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.0168	(36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss					(33) + (36) + (36a) =		39.9523	(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	27.5616	27.4709	27.3820	26.9643	26.8861	26.5223	26.5223	26.4549	26.6625	26.8861	27.0442	27.2095	(38)
Average = Sum(39)m / 12 =	67.5140	67.4232	67.3343	66.9166	66.8384	66.4746	66.4746	66.4073	66.6148	66.8384	66.9965	67.1618	(39)
												66.9162	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0599	1.0584	1.0571	1.0505	1.0493	1.0436	1.0436	1.0425	1.0458	1.0493	1.0518	1.0543	(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													2.0841 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	24.9953	24.6180	24.0812	23.2773	22.5529	21.5556	20.7990	21.7242	22.2097	23.1979	24.2253	24.9754	(42b)
Hot water usage for other uses	35.9731	34.6650	33.3569	32.0488	30.7407	29.4325	29.4325	30.7407	32.0488	33.3569	34.6650	35.9731	(42c)
Average daily hot water use (litres/day)													55.8794 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	60.9684	59.2830	57.4381	55.3261	53.2935	50.9881	50.2315	52.4648	54.2585	56.5548	58.8903	60.9486	(44)
Energy content (annual)	89.7560	78.4433	82.0778	72.2697	68.6741	58.9661	55.5073	61.7521	62.9372	72.8766	79.5922	89.5074	(45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													Total = Sum(45)m = 872.3597

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Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	76.2926	66.6768	69.7661	61.4293	58.3730	50.1212	47.1812	52.4893	53.4966	61.9451	67.6534	76.0813 (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	76.2926	66.6768	69.7661	61.4293	58.3730	50.1212	47.1812	52.4893	53.4966	61.9451	67.6534	76.0813 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64a)m =											741.5058 (64)
Electric shower(s)	47.3796	42.2156	46.0978	43.9906	44.8160	42.7502	44.1752	44.8160	43.9906	46.0978	45.2310	47.3796 (64a)
Heat gains from water heating, kWh/month	30.9180	27.2231	28.9660	26.3550	25.7973	23.2178	22.8391	24.3263	24.3718	27.0107	28.2211	30.8652 (65)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											538.9400 (64a)

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	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	100.6872	111.4751	100.6872	104.0435	100.6872	104.0435	100.6872	100.6872	104.0435	100.6872	104.0435	100.6872	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	182.1728	184.0632	179.2995	169.1581	156.3565	144.3247	136.2868	134.3964	139.1601	149.3014	162.1031	174.1348	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	(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)	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	(71)
Water heating gains (Table 5)	41.5565	40.5106	38.9328	36.6041	34.6737	32.2470	30.6977	32.6967	33.8497	36.3047	39.1960	41.4855	(72)
Total internal gains	378.6778	390.3102	373.1808	364.0670	345.9787	334.8764	321.9330	322.0416	331.3145	340.5547	359.6038	370.5689	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		PF Specific data or Table 6c	Access factor Table 6d		Gains W	
North					4.0500	10.6334	0.5100		0.0000	0.7700		16.9117 (74)	
South					4.0500	46.7521	0.5100		0.0000	0.7700		74.3561 (78)	
Solar gains	91.2678	154.0953	210.0394	263.5333	301.5255	303.0306	290.5542	261.0554	228.0719	169.8188	109.0001	78.3490 (83)	
Total gains	469.9456	544.4055	583.2201	627.6003	647.5042	637.9071	612.4871	583.0969	559.3864	510.3734	468.6039	448.9178 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	39.4114	39.4644	39.5165	39.7632	39.8097	40.0275	40.0275	40.0682	39.9433	39.8097	39.7157	39.6180
alpha	3.6274	3.6310	3.6344	3.6509	3.6540	3.6685	3.6685	3.6712	3.6629	3.6540	3.6477	3.6412
util living area	0.9752	0.9576	0.9318	0.8722	0.7688	0.6077	0.4604	0.4995	0.7027	0.8873	0.9577	0.9787 (86)
MIT	19.3155	19.5793	19.9096	20.3381	20.6875	20.9045	20.9735	20.9640	20.8318	20.3884	19.7829	19.2632 (87)
Th 2	20.0337	20.0349	20.0361	20.0415	20.0425	20.0472	20.0472	20.0481	20.0454	20.0425	20.0404	20.0383 (88)
util rest of house	0.9704	0.9496	0.9186	0.8469	0.7230	0.5345	0.3677	0.4056	0.6351	0.8597	0.9483	0.9746 (89)
MIT 2	18.5078	18.7671	19.0897	19.5014	19.8167	19.9938	20.0373	20.0336	19.9423	19.5569	18.9744	18.4596 (90)
Living area fraction	18.7652	19.0259	19.3510	19.7680	20.0942	20.2840	20.3356	20.3301	fLA = Living area / (4) =			0.3187 (91)
MIT	18.7652	19.0259	19.3510	19.7680	20.0942	20.2840	20.3356	20.3301	20.2258	19.8219	19.2320	18.7157 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7652	19.0259	19.3510	19.7680	20.0942	20.2840	20.3356	20.3301	20.2258	19.8219	19.2320	18.7157 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9622	0.9392	0.9074	0.8387	0.7257	0.5536	0.3965	0.4344	0.6488	0.8524	0.9384	0.9671	(94)
Ext temp.	452.1756	511.3187	529.2204	526.3853	469.8904	353.1470	242.8616	253.2688	362.9283	435.0206	439.7554	434.1306	(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	976.6035	952.4159	865.3128	727.2497	561.0551	377.8446	248.3234	260.9860	408.0662	616.3781	812.8049	974.9001	(97)
Space heating requirement - total per year (kWh/year)	390.1744	296.4173	250.0528	144.6224	67.8265	0.0000	0.0000	0.0000	0.0000	134.9300	268.5956	402.3325	(98a)
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)	390.1744	296.4173	250.0528	144.6224	67.8265	0.0000	0.0000	0.0000	0.0000	134.9300	268.5956	402.3325	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1954.9515	
Space heating per m2	(98c) / (4) =											30.6900	(99)

8c. Space cooling requirement

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Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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												
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	624.8617	491.9124	504.6953	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8290	0.8897	0.8691	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	517.9849	437.6598	438.6115	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	701.9287	674.5091	642.0617	0.0000	0.0000	0.0000	0.0000 (103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	132.4395	176.2158	151.3669	0.0000	0.0000	0.0000	0.0000 (104)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	33.1099	44.0540	37.8417	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												115.0056 (107)
Energy for space heating												30.6900 (99)
Energy for space cooling												1.8054 (108)
Total												32.4954 (109)
Fabric Energy Efficiency (DFEE)												32.5 (109)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	6.0000 (1b)	x 2.4000 (2b)	= 14.4000 (1b) - (3b)
First floor	57.7000 (1c)	x 2.4000 (2c)	= 138.4800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 152.8800 (5)

2. Ventilation rate

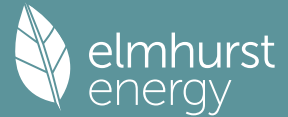
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	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) = 0.1308 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3808 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3237 (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	0.4127	0.4046	0.3965	0.3561	0.3480	0.3075	0.3075	0.2994	0.3237	0.3480	0.3642	0.3803 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5852	0.5819	0.5786	0.5634	0.5605	0.5473	0.5473	0.5448	0.5524	0.5605	0.5663	0.5723 (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							
TER Semi-glazed door			1.9600	1.0000	1.9600		(26a)
TER Opening Type			8.1000	1.1450	9.2748		(27)
Heatloss Floor 1			6.0000	0.1300	0.7800		(28a)
External Wall 1	66.7200	10.0600	56.6600	0.1800	10.1988		(29a)
Planned Roof	57.7000		57.7000	0.1100	6.3470		(30)
Total net area of external elements Aum(A, m ²)			130.4200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	28.5606	(33)
Main dwelling							
Party Wall 1			36.9600	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							150.3758 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E16 Corner (normal)				7.2000	0.0900	0.6480	
P1 Party wall - Ground floor				6.0000	0.0800	0.4800	
E2 Other lintels (including other steel lintels)				6.9300	0.0500	0.3465	
E3 Sill				6.0000	0.0500	0.3000	
E4 Jamb				15.0000	0.0500	0.7500	
E6 Intermediate floor within a dwelling				6.1000	0.0000	0.0000	
E7 Party floor between dwellings (in blocks of flats)				21.7000	0.0700	1.5190	

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E18 Party wall between dwellings	9.6000	0.0600	0.5760
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.4000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	9.4000	0.1200	1.1280
E10 Eaves (insulation at ceiling level)	21.7000	0.0600	1.3020
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			7.0495 (36)
Point Thermal bridges			0.0000
Total fabric heat loss	(33) + (36) + (36a) =		35.6101 (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	29.5219	29.3551	29.1915	28.4234	28.2796	27.6106	27.6106	27.4867	27.8683	28.2796	28.5704	28.8743 (38)
Average = Sum(39)m / 12 =	65.1320	64.9652	64.8016	64.0335	63.8898	63.2207	63.2207	63.0968	63.4784	63.8898	64.1805	64.4845 (39)
												64.0328
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0225	1.0199	1.0173	1.0052	1.0030	0.9925	0.9925	0.9905	0.9965	1.0030	1.0075	1.0123 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	1.0052
												31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0841 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths												25.5652 (42b)
Hot water usage for other uses												35.9731 (42c)
Average daily hot water use (litres/day)												56.4058 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	61.5383	59.8505	58.0077	55.7138	53.6675	51.5409	51.0987	52.9378	54.8240	57.0079	59.3222	61.4519 (44)
Energy content (annual)	97.4616	85.2263	89.1557	76.2694	72.2468	63.3755	61.7995	65.5480	67.6034	77.3592	84.5153	96.2188 (45)
Distribution loss (46)m = 0.15 x (45)m												936.7796
Water storage loss:												0.0000 (46)
Total storage loss:												0.0000 (56)
If cylinder contains dedicated solar storage												0.0000 (57)
Primary loss												0.0000 (59)
Combi loss												0.0000 (61)
Total heat required for water heating calculated for each month												
WWHRS	82.8424	72.4424	75.7824	64.8290	61.4097	53.8692	52.5296	55.7158	57.4629	65.7553	71.8380	81.7860 (62)
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 (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	82.8424	72.4424	75.7824	64.8290	61.4097	53.8692	52.5296	55.7158	57.4629	65.7553	71.8380	81.7860 (64)
12Total per year (kWh/year)												796.2626 (64)
Electric shower(s)	47.3796	42.2156	46.0978	43.9906	44.8160	42.7502	44.1752	44.8160	43.9906	46.0978	45.2310	47.3796 (64a)
Heat gains from water heating, kWh/month	32.5555	28.6645	30.4700	27.2049	26.5564	24.1548	24.1762	25.1330	25.3634	27.9633	29.2673	32.2914 (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	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	100.6872	111.4751	100.6872	104.0435	100.6872	104.0435	100.6872	100.6872	104.0435	100.6872	104.0435	100.6872 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	182.1728	184.0632	179.2995	169.1581	156.3565	144.3247	136.2868	134.3964	139.1601	149.3014	162.1031	174.1348 (68)
Pumps, fans	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204 (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)
Water heating gains (Table 5)	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634 (71)
Total internal gains	43.7574	42.6555	40.9544	37.7846	35.6942	33.5484	32.4949	33.7809	35.2269	37.5851	40.6490	43.4024 (72)
	380.8787	392.4551	375.2023	365.2474	346.9991	336.1778	323.7301	323.1257	332.6917	341.8350	361.0568	372.4857 (73)

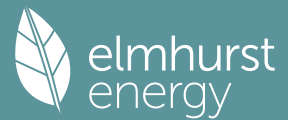
6. Solar gains

[Jan]												Gains
					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d			W
North					4.0500	10.6334	0.6300	0.7000	0.7700			13.1613 (74)
South					4.0500	46.7521	0.6300	0.7000	0.7700			57.8666 (78)
Solar gains	71.0279	119.9224	163.4601	205.0909	234.6578	235.8291	226.1195	203.1625	177.4936	132.1590	84.8278	60.9739 (83)
Total gains	451.9065	512.3775	538.6624	570.3383	581.6569	572.0070	549.8496	526.2883	510.1853	473.9940	445.8846	433.4597 (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

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tau	40.8527	40.9576	41.0610	41.5535	41.6470	42.0877	42.0877	42.1704	41.9169	41.6470	41.4583	41.2629
alpha	3.7235	3.7305	3.7374	3.7702	3.7765	3.8058	3.8058	3.8114	3.7945	3.7765	3.7639	3.7509
util living area	0.9774	0.9631	0.9425	0.8918	0.7990	0.6390	0.4865	0.5243	0.7273	0.9000	0.9618	0.9804 (86)
MIT	19.3572	19.5941	19.9001	20.3198	20.6690	20.8997	20.9726	20.9633	20.8285	20.3919	19.8171	19.3211 (87)
Th 2	20.0646	20.0668	20.0689	20.0790	20.0809	20.0896	20.0896	20.0912	20.0862	20.0809	20.0771	20.0731 (88)
util rest of house	0.9731	0.9561	0.9312	0.8696	0.7567	0.5676	0.3937	0.4313	0.6627	0.8752	0.9534	0.9766 (89)
MIT 2	18.5718	18.8061	19.1071	19.5172	19.8372	20.0321	20.0790	20.0760	19.9789	19.5928	19.0358	18.5424 (90)
Living area fraction	18.8221	19.0572	19.3598	19.7730	20.1023	20.3086	20.3638	20.3588	20.2496	19.8474	19.2848	18.7905 (91)
MIT	18.8221	19.0572	19.3598	19.7730	20.1023	20.3086	20.3638	20.3588	20.2496	19.8474	19.2848	18.7905 (92)
Temperature adjustment	18.8221	19.0572	19.3598	19.7730	20.1023	20.3086	20.3638	20.3588	20.2496	19.8474	19.2848	18.7905 (93)
adjusted MIT	18.8221	19.0572	19.3598	19.7730	20.1023	20.3086	20.3638	20.3588	20.2496	19.8474	19.2848	18.7905 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9656	0.9467	0.9207	0.8611	0.7578	0.5856	0.4224	0.4596	0.6751	0.8678	0.9443	0.9698 (94)
Useful gains	436.3482	485.0705	495.9703	491.1321	440.7917	334.9873	232.2775	241.9046	344.4422	411.3293	421.0475	420.3560 (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	945.8527	919.7248	833.3359	696.2336	536.8214	360.9030	237.9485	249.7877	390.3692	590.8158	782.0252	940.8629 (97)
Space heating kWh	379.0714	292.0877	251.0000	147.6731	71.4462	0.0000	0.0000	0.0000	0.0000	133.5380	259.9039	387.2571 (98a)
Space heating requirement - total per year (kWh/year)												1921.9774
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	379.0714	292.0877	251.0000	147.6731	71.4462	0.0000	0.0000	0.0000	0.0000	133.5380	259.9039	387.2571 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1921.9774
Space heating per m2										(98c) / (4) =		30.1723 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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	0.0000	0.0000	0.0000	0.0000	0.0000	594.2747	467.8333	479.5358	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8112	0.8780	0.8576	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	482.0778	410.7448	411.2448	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	624.6829	600.9930	575.4789	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	102.6757	141.5447	122.1902	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									f _c = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	25.6689	35.3862	30.5475	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												91.6026 (107)
Energy for space heating												30.1723 (99)
Energy for space cooling												1.4380 (108)
Total												31.6104 (109)
Fabric Energy Efficiency (TFEE)												31.6 (109)

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

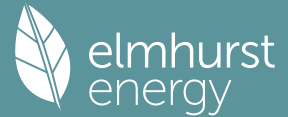
1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	6.0000 (1b)	x 2.4000 (2b)	= 14.4000 (1b) - (3b)
First floor	57.7000 (1c)	x 2.4000 (2c)	= 138.4800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	152.8800 (5)

2. Ventilation rate

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)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1308 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.2808 (18)

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Number of sides sheltered

2 (19)

Shelter factor

$$(20) = 1 - [0.075 \times (19)] = 0.8500 \quad (20)$$

Infiltration rate adjusted to include shelter factor

$$(21) = (18) \times (20) = 0.2387 \quad (21)$$

	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	0.3043	0.2984	0.2924	0.2626	0.2566	0.2268	0.2268	0.2208	0.2387	0.2566	0.2685	0.2805	(22b)
Effective ac	0.5463	0.5445	0.5428	0.5345	0.5329	0.5257	0.5257	0.5244	0.5285	0.5329	0.5361	0.5393	(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								
Ent Door			1.9600	1.1000	2.1560			(26a)
Windows			8.1000	1.0536	8.5345			(27)
Heatloss Floor 1			6.0000	0.1200	0.7200	75.0000	450.0000	(28a)
External Wall 1	66.7200	10.0600	56.6600	0.2000	11.3320	60.0000	3399.6000	(29a)
Planned Roof	57.7000		57.7000	0.0900	5.1930	9.0000	519.3000	(30)
Total net area of external elements Aum(A, m2)			130.4200					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	27.9355		(33)
Main dwelling								
Party Wall 1			36.9600	0.0000	0.0000	70.0000	2587.2000	(32)
Party Floor 1			49.7000			30.0000	1491.0000	(32d)
Internal Wall 1			113.7600			9.0000	1023.8400	(32c)
Internal Floor 1			6.0000			18.0000	108.0000	(32d)

Heat capacity Cm = Sum(A x k)

$$(28)...(30) + (32) + (32a)...(32e) = 9578.9400 \quad (34)$$

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

$$150.3758 \quad (35)$$

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E16 Corner (normal)	7.2000	0.0570	0.4104	
P1 Party wall - Ground floor	6.0000	0.3200	1.9200	
E2 Other lintels (including other steel lintels)	6.9300	0.0480	0.3326	
E3 Sill	6.0000	0.0450	0.2700	
E4 Jamb	15.0000	0.0510	0.7650	
E6 Intermediate floor within a dwelling	6.1000	0.0000	0.0000	
E7 Party floor between dwellings (in blocks of flats)	21.7000	0.0640	1.3888	
E18 Party wall between dwellings	9.6000	0.0620	0.5952	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.4000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	9.4000	0.4800	4.5120	
E10 Eaves (insulation at ceiling level)	21.7000	0.0840	1.8228	

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

$$12.0168 \quad (36)$$

Point Thermal Bridges

$$(36a) = 0.0000$$

Total fabric heat loss

$$(33) + (36) + (36a) = 39.9523 \quad (37)$$

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

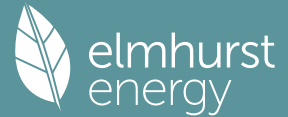
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.5616	27.4709	27.3820	26.9643	26.8861	26.5223	26.5223	26.4549	26.6625	26.8861	27.0442	27.2095	(38)
Heat transfer coeff	67.5140	67.4232	67.3343	66.9166	66.8384	66.4746	66.4746	66.4073	66.6148	66.8384	66.9965	67.1618	(39)
Average = Sum(39)m / 12 =												66.9162	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0599	1.0584	1.0571	1.0505	1.0493	1.0436	1.0436	1.0425	1.0458	1.0493	1.0518	1.0543	(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													2.0841 (42)
Hot water usage for mixer showers	57.6681	56.7852	55.4841	53.4825	51.6891	49.1801	47.1957	49.5156	50.6824	53.1674	55.7553	57.6161	(42a)
Hot water usage for baths	24.9953	24.6180	24.0812	23.2773	22.5529	21.5556	20.7990	21.7242	22.2097	23.1979	24.2253	24.9754	(42b)
Hot water usage for other uses	35.9731	34.6650	33.3569	32.0488	30.7407	29.4325	29.4325	30.7407	32.0488	33.3569	34.6650	35.9731	(42c)
Average daily hot water use (litres/day)												109.0449	(43)
Daily hot water use	118.6365	116.0682	112.9221	108.8086	104.9826	100.1683	97.4272	101.9804	104.9409	109.7222	114.6456	118.5647	(44)
Energy conte	174.6534	153.5817	161.3634	142.1312	135.2807	115.8412	107.6600	120.0329	121.7262	141.3882	154.9474	174.1209	(45)
Energy content (annual)										Total = Sum(45)m =		1702.7271	
Distribution loss (46)m = 0.15 x (45)m	26.1980	23.0373	24.2045	21.3197	20.2921	17.3762	16.1490	18.0049	18.2589	21.2082	23.2421	26.1181	(46)
Water storage loss:													
Store volume												201.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	201.6048	177.9249	188.3148	168.2132	162.2321	141.9232	134.6114	146.9843	147.8082	168.3396	181.0294	201.0723	(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	-2.0808	-4.5647	-9.4867	-14.9101	-20.3861	-20.7584	-20.4820	-16.9790	-12.0069	-6.7007	-2.8278	-1.6308	(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	199.5240	173.3601	178.8282	153.3031	141.8460	121.1649	114.1294	130.0052	135.8014	161.6389	178.2015	199.4415	(64)
Total per year (kWh/year) = Sum(64)m =												1887.2441	(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	58.0723	51.0659	53.6533	47.2586	44.9808	38.5172	35.7969	39.9109	40.4740	47.0116	51.5200	57.8952	(65)

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.1347	24.9890	20.3224	15.3854	11.5007	9.7094	10.4914	13.6371	18.3036	23.2407	27.1253	28.9166 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	271.8997	274.7212	267.6112	252.4748	233.3678	215.4100	203.4131	200.5916	207.7016	222.8380	241.9449	259.9028 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886 (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)	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634 (71)
Water heating gains (Table 5)	78.0541	75.9909	72.1147	65.6370	60.4581	53.4961	48.1142	53.6437	56.2138	63.1876	71.5555	77.8161 (72)
Total internal gains	469.3588	466.9713	451.3185	424.7674	396.5970	369.8858	353.2889	359.1427	373.4894	400.5365	431.8960	457.9058 (73)

6. Solar gains

[Jan]	Area		Solar flux		Specific data		Specific data		Access		Gains	
	m2		Table 6a		or Table 6b		or Table 6c		factor		W	
			W/m2						Table 6d			
North	4.0500		10.6334		0.5100		0.0000		0.7700		16.9117 (74)	
South	4.0500		46.7521		0.5100		0.0000		0.7700		74.3561 (78)	
Solar gains	91.2678	154.0953	210.0394	263.5333	301.5255	303.0306	290.5542	261.0554	228.0719	169.8188	109.0001	78.3490 (83)
Total gains	560.6266	621.0667	661.3579	688.3007	698.1225	672.9165	643.8431	620.1981	601.5612	570.3553	540.8962	536.2548 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	39.4114	39.4644	39.5165	39.7632	39.8097	40.0275	40.0275	40.0682	39.9433	39.8097	39.7157	39.6180
alpha	3.6274	3.6310	3.6344	3.6509	3.6540	3.6685	3.6685	3.6712	3.6629	3.6540	3.6477	3.6412
util living area	0.9585	0.9391	0.9063	0.8437	0.7374	0.5832	0.4402	0.4733	0.6700	0.8552	0.9372	0.9639 (86)
MIT	19.5146	19.7352	20.0504	20.4222	20.7304	20.9166	20.9771	20.9698	20.8569	20.4766	19.9296	19.4586 (87)
Th 2	20.0337	20.0349	20.0361	20.0415	20.0425	20.0472	20.0472	20.0481	20.0454	20.0425	20.0404	20.0383 (88)
util rest of house	0.9510	0.9283	0.8895	0.8152	0.6897	0.5110	0.3507	0.3830	0.6016	0.8230	0.9243	0.9573 (89)
MIT 2	18.3247	18.6006	18.9914	19.4441	19.7959	19.9880	20.0363	20.0327	19.9347	19.5186	18.8523	18.2579 (90)
Living area fraction	18.3247	18.6006	18.9914	19.4441	19.7959	19.9880	20.0363	20.0327	19.9347	19.5186	18.8523	18.2579 (90)
MIT	18.7039	18.9622	19.3289	19.7558	20.0937	20.2840	20.3361	20.3313	20.2286	19.8239	19.1956	18.6405 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7039	18.9622	19.3289	19.7558	20.0937	20.2840	20.3361	20.3313	20.2286	19.8239	19.1956	18.6405 (93)

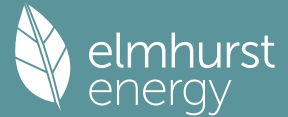
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9377	0.9136	0.8749	0.8056	0.6924	0.5297	0.3785	0.4106	0.6156	0.8146	0.9102	0.9448 (94)
Useful gains	525.6964	567.3882	578.6442	554.5155	483.4040	356.4526	243.6695	254.6468	370.3172	464.5963	492.3091	506.6451 (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	972.4654	948.1157	863.8232	726.4358	561.0239	377.8394	248.3562	261.0680	408.2564	616.5102	810.3634	969.8536 (97)
Space heating kWh	332.3962	255.8488	212.1732	123.7827	57.7492	0.0000	0.0000	0.0000	0.0000	113.0239	228.9991	344.6271 (98a)
Space heating requirement - total per year (kWh/year)												1668.6002
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	332.3962	255.8488	212.1732	123.7827	57.7492	0.0000	0.0000	0.0000	0.0000	113.0239	228.9991	344.6271 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1668.6002
Space heating per m2										(98c) / (4) =		26.1947 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Fraction of main heating from main system 2												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
Efficiency of main space heating system 1 (in %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	332.3962	255.8488	212.1732	123.7827	57.7492	0.0000	0.0000	0.0000	0.0000	113.0239	228.9991	344.6271 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	332.3962	255.8488	212.1732	123.7827	57.7492	0.0000	0.0000	0.0000	0.0000	113.0239	228.9991	344.6271 (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)												

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Space heating fuel used, main 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	(215)
													(213)
Water heating requirement	199.5240	173.3601	178.8282	153.3031	141.8460	121.1649	114.1294	130.0052	135.8014	161.6389	178.2015	199.4415	(64)
Efficiency of water heater (217)m	346.6091	346.6091	346.6091	346.6091	346.6091	346.6091	346.6091	346.6091	346.6091	346.6091	346.6091	346.6091	(216)
Fuel for water heating, kWh/month	57.5646	50.0160	51.5936	44.2294	40.9239	34.9572	32.9274	37.5077	39.1800	46.6343	51.4128	57.5408	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	24.6261	19.7560	17.7881	13.0323	10.0665	8.2244	9.1830	11.9364	15.5043	20.3424	22.9767	25.3105	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-11.8299	-18.4822	-29.1257	-35.2595	-39.1032	-34.8758	-34.4178	-31.3459	-26.3461	-21.6739	-13.5116	-10.0364	(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	0.3681	0.5697	0.5212	-0.6360	-3.0583	-5.7806	-5.7036	-4.7263	-3.3403	-0.2636	0.3160	0.3221	(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												1668.6002	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												346.6091	
Water heating fuel used												544.4877	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												198.7468	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-327.4197	(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												2084.4150	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1 (high-rate cost)	1668.6002	19.6000	327.0456 (240)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (240)
Space heating - main system 2 (1.00*19.60 + 0.00*9.40)	0.0000	19.6000	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (electric off-peak tariff)			
High-rate fraction			0.0405 (243)
Low-rate fraction			0.9595 (244)
High-rate cost		19.6000	4.3202 (245)
Low-rate cost	22.0417	9.4000	49.1099 (246)
Energy for instantaneous electric shower(s)	0.0000	18.5800	0.0000 (247a)
Pumps, fans and electric keep-hot (0.90*19.60 + 0.10*9.40)	0.0000	0.0000	0.0000 (249)
Energy for lighting (0.90*19.60 + 0.10*9.40)	198.7468	18.5800	36.9272 (250)
Additional standing charges			7.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-306.0080	18.5800	-56.8563
PV Unit electricity exported	-21.4117	5.5900	-1.1969
Total			-58.0532 (252)
Total energy cost			366.3497 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)		1.2133 (257)
SAP value		80.3324
SAP rating (Section 12)		80 (258)
SAP band		C

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 (high-rate cost)	1668.6002	0.1629	271.7945 (261)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (261)
Space heating - main system 2 (high-rate cost)	0.0000	0.0000	0.0000 (262)
Space heating - main system 2 (low-rate cost)	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating - high rate cost	22.0417	0.1490	3.2842 (264)
Water heating - low rate cost	522.4460	0.1251	65.3355 (264)
Space and water heating			340.4143 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	198.7468	0.1490	29.6172 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-306.0080	0.1380	-42.2201
PV Unit electricity exported	-21.4117	0.0973	-2.0842

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Total
Total CO₂, kg/year -44.3043 (269)
CO₂ emissions per m² 325.7272 (272)
EI value 5.1100 (273)
EI rating 95.9846
EI band 96 (274)
A

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	6.0000 (1b)	x 2.4000 (2b)	= 14.4000 (1b) - (3b)
First floor	57.7000 (1c)	x 2.4000 (2c)	= 138.4800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 152.8800 (5)

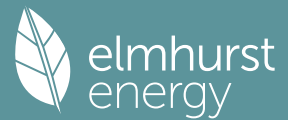
2. Ventilation rate

	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	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) = 0.1308 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2808 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2387 (21)
Wind speed	Jan 3.8000 Feb 3.5000 Mar 3.7000 Apr 3.4000 May 3.5000 Jun 3.0000 Jul 3.1000 Aug 3.0000 Sep 3.0000 Oct 3.2000 Nov 3.1000 Dec 3.5000 (22)
Wind factor	0.9500 0.8750 0.9250 0.8500 0.8750 0.7500 0.7750 0.7500 0.7500 0.8000 0.7750 0.8750 (22a)
Adj infilt rate	0.2268 0.2089 0.2208 0.2029 0.2089 0.1790 0.1850 0.1790 0.1790 0.1910 0.1850 0.2089 (22b)
Effective ac	0.5257 0.5218 0.5244 0.5206 0.5218 0.5160 0.5171 0.5160 0.5160 0.5182 0.5171 0.5218 (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							
Ent Door			1.9600	1.1000	2.1560		(26a)
Windows			8.1000	1.0536	8.5345		(27)
Heatloss Floor 1			6.0000	0.1200	0.7200	75.0000	(28a)
External Wall 1	66.7200	10.0600	56.6600	0.2000	11.3320	60.0000	(29a)
Planned Roof	57.7000		57.7000	0.0900	5.1930	9.0000	(30)
Total net area of external elements Aum(A, m ²)			130.4200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.9355		(33)
Main dwelling							
Party Wall 1			36.9600	0.0000	0.0000	70.0000	(32)
Party Floor 1			49.7000			30.0000	(32d)
Internal Wall 1			113.7600			9.0000	(32c)
Internal Floor 1			6.0000			18.0000	(32d)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9578.9400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							150.3758 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E16 Corner (normal)				7.2000	0.0570	0.4104	
P1 Party wall - Ground floor				6.0000	0.3200	1.9200	
E2 Other lintels (including other steel lintels)				6.9300	0.0480	0.3326	
E3 Sill				6.0000	0.0450	0.2700	
E4 Jamb				15.0000	0.0510	0.7650	
E6 Intermediate floor within a dwelling				6.1000	0.0000	0.0000	
E7 Party floor between dwellings (in blocks of flats)				21.7000	0.0640	1.3888	
E18 Party wall between dwellings				9.6000	0.0620	0.5952	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				9.4000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)				9.4000	0.4800	4.5120	
E10 Eaves (insulation at ceiling level)				21.7000	0.0840	1.8228	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.0168 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	39.9523 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	Jan 26.5223	Feb 26.3256	Mar 26.4549	Apr 26.2636	May 26.3256	Jun 26.0337	Jul 26.0885
Heat transfer coeff	26.0337	26.0337	26.0337	26.0337	26.1450	26.0885	26.3256 (38)

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Average = Sum(39)m / 12 =	66.4746	66.2779	66.4073	66.2159	66.2779	65.9860	66.0408	65.9860	65.9860	66.0974	66.0408	66.2779 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0436	1.0405	1.0425	1.0395	1.0405	1.0359	1.0367	1.0359	1.0359	1.0376	1.0367	1.0405 (40)
HLP (average)												1.0388
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0841 (42)
Hot water usage for mixer showers												
Hot water usage for baths	57.6681	56.7852	55.4841	53.4825	51.6891	49.1801	47.1957	49.5156	50.6824	53.1674	55.7553	57.6161 (42a)
Hot water usage for other uses	24.9953	24.6180	24.0812	23.2773	22.5529	21.5556	20.7990	21.7242	22.2097	23.1979	24.2253	24.9754 (42b)
Average daily hot water use (litres/day)	35.9731	34.6650	33.3569	32.0488	30.7407	29.4325	29.4325	30.7407	32.0488	33.3569	34.6650	35.9731 (42c)
												109.0449 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	118.6365	116.0682	112.9221	108.8086	104.9826	100.1683	97.4272	101.9804	104.9409	109.7222	114.6456	118.5647 (44)
Energy content (annual)	174.6534	153.5817	161.3634	142.1312	135.2807	115.8412	107.6600	120.0329	121.7262	141.3882	154.9474	174.1209 (45)
Distribution loss (46)m = 0.15 x (45)m	26.1980	23.0373	24.2045	21.3197	20.2921	17.3762	16.1490	18.0049	18.2589	21.2082	23.2421	26.1181 (46)
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	201.6048	177.9249	188.3148	168.2132	162.2321	141.9232	134.6114	146.9843	147.8082	168.3396	181.0294	201.0723 (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	-2.6909	-4.8570	-9.9995	-16.0669	-21.0595	-23.1841	-22.7025	-19.4690	-13.6869	-7.8817	-3.5742	-2.1273 (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	198.9139	173.0679	178.3153	152.1463	141.1726	118.7391	111.9089	127.5152	134.1213	160.4579	177.4551	198.9450 (64)
												1872.7586 (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	58.0723	51.0659	53.6533	47.2586	44.9808	38.5172	35.7969	39.9109	40.4740	47.0116	51.5200	57.8952 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.1347	24.9890	20.3224	15.3854	11.5007	9.7094	10.4914	13.6371	18.3036	23.2407	27.1253	28.9166 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	271.8997	274.7212	267.6112	252.4748	233.3678	215.4100	203.4131	200.5916	207.7016	222.8380	241.9449	259.9028 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886 (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)	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634 (71)
Water heating gains (Table 5)	78.0541	75.9909	72.1147	65.6370	60.4581	53.4961	48.1142	53.6437	56.2138	63.1876	71.5555	77.8161 (72)
Total internal gains	469.3588	466.9713	451.3185	424.7674	396.5970	369.8858	353.2889	359.1427	373.4894	400.5365	431.8960	457.9058 (73)

6. Solar gains

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

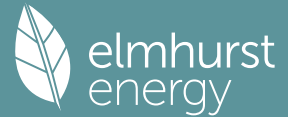
North						4.0500	12.7650	0.5100	0.0000			0.7700	20.3020 (74)	
South						4.0500	54.2217	0.5100	0.0000			0.7700	86.2361 (78)	

Solar gains	106.5381	157.2805	213.7331	274.6425	306.9440	327.4679	311.9001	285.5992	246.2680	186.2338	125.3438	91.9963 (83)		
Total gains	575.8968	624.2518	665.0516	699.4099	703.5410	697.3538	665.1890	644.7419	619.7574	586.7703	557.2399	549.9021 (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	40.0275	40.1464	40.0682	40.1839	40.1464	40.3240	40.2905	40.3240	40.3240	40.2560	40.2905	40.1464
alpha	3.6685	3.6764	3.6712	3.6789	3.6764	3.6883	3.6860	3.6883	3.6883	3.6837	3.6860	3.6764
util living area	0.9488	0.9304	0.8873	0.8087	0.6809	0.4811	0.3334	0.3530	0.6036	0.8161	0.9210	0.9556 (86)
MIT	19.6923	19.8701	20.2083	20.5545	20.8202	20.9639	20.9931	20.9914	20.9112	20.6058	20.0918	19.6296 (87)
Th 2	20.0472	20.0497	20.0481	20.0505	20.0497	20.0535	20.0528	20.0535	20.0535	20.0528	20.0528	20.0497 (88)
util rest of house	0.9394	0.9180	0.8669	0.7743	0.6252	0.4026	0.2425	0.2600	0.5284	0.7763	0.9047	0.9474 (89)

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MIT 2	18.5572	18.7792	19.1933	19.6050	19.8963	20.0324	20.0506	20.0507	19.9912	19.6739	19.0612	18.4810 (90)
Living area fraction									FLA = Living area / (4) =			0.3187 (91)
MIT	18.9190	19.1269	19.5168	19.9076	20.1907	20.3292	20.3510	20.3505	20.2844	19.9709	19.3897	18.8470 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9190	19.1269	19.5168	19.9076	20.1907	20.3292	20.3510	20.3505	20.2844	19.9709	19.3897	18.8470 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9255	0.9034	0.8537	0.7686	0.6340	0.4261	0.2715	0.2895	0.5476	0.7725	0.8909	0.9342	(94)
Useful gains	533.0203	563.9471	567.7877	537.5921	446.0261	297.1157	180.5696	186.6694	339.3822	453.2604	496.4684	513.7064	(95)
Ext temp.	5.0000	5.5000	7.4000	9.8000	12.7000	15.7000	17.6000	17.5000	14.8000	11.4000	7.8000	4.9000	(96)
Heat loss rate W	925.2580	903.1602	804.6411	669.2836	496.4699	305.4642	181.6766	188.0905	361.8912	566.5120	765.3903	924.3812	(97)
Space heating kWh	291.8249	227.9512	176.2189	94.8178	37.5302	0.0000	0.0000	0.0000	0.0000	84.2592	193.6237	305.5421	(98a)
Space heating requirement - total per year (kWh/year)												1411.7680	
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	291.8249	227.9512	176.2189	94.8178	37.5302	0.0000	0.0000	0.0000	0.0000	84.2592	193.6237	305.5421	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1411.7680	
Space heating per m2										(98c) / (4) =		22.1628	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	291.8249	227.9512	176.2189	94.8178	37.5302	0.0000	0.0000	0.0000	0.0000	84.2592	193.6237	305.5421 (98)	
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)	
Space heating fuel (main heating system)	291.8249	227.9512	176.2189	94.8178	37.5302	0.0000	0.0000	0.0000	0.0000	84.2592	193.6237	305.5421 (211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)	
Space heating fuel used, main system 2												0.0000 (213)	
Water heating													
Water heating requirement	198.9139	173.0679	178.3153	152.1463	141.1726	118.7391	111.9089	127.5152	134.1213	160.4579	177.4551	198.9450 (64)	
Efficiency of water heater (217)m	346.6091	346.6091	346.6091	346.6091	346.6091	346.6091	346.6091	346.6091	346.6091	346.6091	346.6091	346.6091 (216)	
Fuel for water heating, kWh/month	57.3885	49.9317	51.4456	43.8956	40.7296	34.2574	32.2868	36.7893	38.6953	46.2936	51.1975	57.3975 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)	
Lighting	24.6261	19.7560	17.7881	13.0323	10.0665	8.2244	9.1830	11.9364	15.5043	20.3424	22.9767	25.3105 (232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-13.8342	-19.0733	-29.6672	-36.0943	-38.9406	-36.8573	-36.2366	-33.6203	-28.2515	-23.4826	-15.4977	-11.8214 (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	0.3792	0.4677	0.1458	-1.4092	-4.0199	-6.4577	-6.3234	-5.4209	-3.8084	-0.7082	0.2481	0.3479 (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												1411.7680 (211)	
Space heating fuel - main system 2												0.0000 (213)	
Space heating fuel - secondary												0.0000 (215)	
Efficiency of water heater												346.6091	
Water heating fuel used												540.3085 (219)	
Space cooling fuel												0.0000 (221)	
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000 (231)	
Electricity for lighting (calculated in Appendix L)												198.7468 (232)	
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-349.9360 (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												1800.8874 (238)	

10a. Fuel costs - using BEDF prices (577)

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	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1 (high-rate cost)	1411.7680	34.6000	488.4717 (240)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (240)
Space heating - main system 2 (1.00*34.60 + 0.00*15.80)	0.0000	34.6000	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (electric off-peak tariff)			
High-rate fraction			0.0405 (243)
Low-rate fraction			0.9595 (244)
High-rate cost			7.5679 (245)
Low-rate cost	21.8725	34.6000	81.9129 (246)
Energy for instantaneous electric shower(s)	518.4360	15.8000	0.0000 (247a)
Pumps, fans and electric keep-hot (0.90*34.60 + 0.10*15.80)	0.0000	32.7200	0.0000 (249)
Energy for lighting (0.90*34.60 + 0.10*15.80)	0.0000	0.0000	65.0299 (250)
Additional standing charges	198.7468	32.7200	8.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-323.3770	32.7200	-105.8089
PV Unit electricity exported	-26.5590	5.8100	-1.5431
Total			-107.3520 (252)
Total energy cost			543.6304 (255)

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 (high-rate cost)	1411.7680	0.1635	230.8603 (261)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (261)
Space heating - main system 2 (high-rate cost)	0.0000	0.0000	0.0000 (262)
Space heating - main system 2 (low-rate cost)	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating - high rate cost	21.8725	0.1491	3.2615 (264)
Water heating - low rate cost	518.4360	0.1252	64.8836 (264)
Space and water heating			299.0053 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	198.7468	0.1490	29.6172 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-323.3770	0.1381	-44.6626
PV Unit electricity exported	-26.5590	0.1025	-2.7221
Total			-47.3846 (269)
Total CO2, kg/year			281.2379 (272)

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 (high-rate cost)	1411.7680	1.6096	2272.3745 (275)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (275)
Space heating - main system 2 (high-rate cost)	0.0000	0.0000	0.0000 (276)
Space heating - main system 2 (low-rate cost)	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating - high rate cost	21.8725	1.5573	34.0613 (278)
Water heating - low rate cost	518.4360	1.4483	750.8581 (278)
Space and water heating			3057.2938 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	198.7468	1.5547	309.0005 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-323.3770	1.5149	-489.8879
PV Unit electricity exported	-26.5590	0.3747	-9.9509
Total			-499.8388 (283)
Total Primary energy kWh/year			2866.4555 (286)

SAP 10 EPC IMPROVEMENTS

1st Flr Flat edle

Current energy efficiency rating: C 80
Current environmental impact rating: A 96

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures Typical annual savings Energy Environmental
(none) efficiency impact
Total Savings £0 0.00 kg/m²

Potential energy efficiency rating: C 80
Potential environmental impact rating: A 96

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, South East England):

	Current £651	Potential £651	Saving £0
Electricity			
Space heating	£496	£496	£0
Water heating	£89	£89	£0
Lighting	£65	£65	£0

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Generated (PV)	-£107	-£107	£0
Total cost of fuels	£544	£544	£0
Total cost of uses	£543	£543	£0
Delivered energy	28 kWh/m²	28 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m²	4 kg/m²	4 kg/m²	0 kg/m²
Primary energy	45 kWh/m²	45 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	6.0000 (1b)	x 2.4000 (2b)	= 14.4000 (1b) - (3b)
First floor	57.7000 (1c)	x 2.4000 (2c)	= 138.4800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	152.8800 (5)

2. Ventilation rate

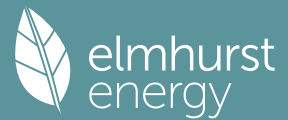
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.1308 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2808 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2387 (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	0.3043	0.2984	0.2924	0.2626	0.2566	0.2268	0.2268	0.2208	0.2387	0.2566	0.2685	0.2805 (22b)
Effective ac	0.5463	0.5445	0.5428	0.5345	0.5329	0.5257	0.5257	0.5244	0.5285	0.5329	0.5361	0.5393 (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							
Ent Door			1.9600	1.1000	2.1560		(26a)
Windows			8.1000	1.0536	8.5345		(27)
Heatloss Floor 1			6.0000	0.1200	0.7200	75.0000	450.0000 (28a)
External Wall 1	66.7200	10.0600	56.6600	0.2000	11.3320	60.0000	3399.6000 (29a)
Planned Roof	57.7000		57.7000	0.0900	5.1930	9.0000	519.3000 (30)
Total net area of external elements Aum(A, m2)			130.4200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.9355		(33)
Main dwelling							
Party Wall 1			36.9600	0.0000	0.0000	70.0000	2587.2000 (32)
Party Floor 1			49.7000			30.0000	1491.0000 (32d)
Internal Wall 1			113.7600			9.0000	1023.8400 (32c)
Internal Floor 1			6.0000			18.0000	108.0000 (32d)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9578.9400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							150.3758 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E16 Corner (normal)				7.2000	0.0570	0.4104	
P1 Party wall - Ground floor				6.0000	0.3200	1.9200	
E2 Other lintels (including other steel lintels)				6.9300	0.0480	0.3326	
E3 Sill				6.0000	0.0450	0.2700	
E4 Jamb				15.0000	0.0510	0.7650	
E6 Intermediate floor within a dwelling				6.1000	0.0000	0.0000	
E7 Party floor between dwellings (in blocks of flats)				21.7000	0.0640	1.3888	
E18 Party wall between dwellings				9.6000	0.0620	0.5952	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				9.4000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)				9.4000	0.4800	4.5120	
E10 Eaves (insulation at ceiling level)				21.7000	0.0840	1.8228	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.0168 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	39.9523 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							

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(38)m	Jan 27.5616	Feb 27.4709	Mar 27.3820	Apr 26.9643	May 26.8861	Jun 26.5223	Jul 26.5223	Aug 26.4549	Sep 26.6625	Oct 26.8861	Nov 27.0442	Dec 27.2095	(38)
Heat transfer coeff	67.5140	67.4232	67.3343	66.9166	66.8384	66.4746	66.4746	66.4073	66.6148	66.8384	66.9965	67.1618	(39)
Average = Sum(39)m / 12 =												66.9162	

HLP	Jan 1.0599	Feb 1.0584	Mar 1.0571	Apr 1.0505	May 1.0493	Jun 1.0436	Jul 1.0436	Aug 1.0425	Sep 1.0458	Oct 1.0493	Nov 1.0518	Dec 1.0543	(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													2.0841	(42)
Hot water usage for mixer showers														
57.6681	56.7852	55.4841	53.4825	51.6891	49.1801	47.1957	49.5156	50.6824	53.1674	55.7553	57.6161	57.6161	(42a)	
Hot water usage for baths														
24.9953	24.6180	24.0812	23.2773	22.5529	21.5556	20.7990	21.7242	22.2097	23.1979	24.2253	24.9754	24.9754	(42b)	
Hot water usage for other uses														
35.9731	34.6650	33.3569	32.0488	30.7407	29.4325	29.4325	30.7407	32.0488	33.3569	34.6650	35.9731	35.9731	(42c)	
Average daily hot water use (litres/day)												109.0449	(43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
118.6365	116.0682	112.9221	108.8086	104.9826	100.1683	97.4272	101.9804	104.9409	109.7222	114.6456	118.5647	118.5647	(44)	
Energy content	174.6534	153.5817	161.3634	142.1312	135.2807	115.8412	107.6600	120.0329	121.7262	141.3882	154.9474	174.1209	(45)	
Energy content (annual)										Total =	Sum(45)m =	1702.7271		
Distribution loss (46)m = 0.15 x (45)m														
26.1980	23.0373	24.2045	21.3197	20.2921	17.3762	16.1490	18.0049	18.2589	21.2082	23.2421	26.1181	26.1181	(46)	
Water storage loss:														
Store volume												201.0000	(47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)	
Temperature factor from Table 2b												0.5400	(49)	
Enter (49) or (54) in (55)												0.8694	(55)	
Total storage loss														
26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	(56)	
If cylinder contains dedicated solar storage														
26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	(57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)	
Total heat required for water heating calculated for each month														
201.6048	177.9249	188.3148	168.2132	162.2321	141.9232	134.6114	146.9843	147.8082	168.3396	181.0294	201.0723	201.0723	(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	-2.0808	-4.5647	-9.4867	-14.9101	-20.3861	-20.7584	-20.4820	-16.9790	-12.0069	-6.7007	-2.8278	-1.6308	(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	199.5240	173.3601	178.8282	153.3031	141.8460	121.1649	114.1294	130.0052	135.8014	161.6389	178.2015	199.4415	(64)	
								Total per year (kWh/year) =	Sum(64)m =			1887.2441	(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	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														
58.0723	51.0659	53.6533	47.2586	44.9808	38.5172	35.7969	39.9109	40.4740	47.0116	51.5200	57.8952	57.8952	(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	
125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
28.1347	24.9890	20.3224	15.3854	11.5007	9.7094	10.4914	13.6371	18.3036	23.2407	27.1253	28.9166	28.9166	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
271.8997	274.7212	267.6112	252.4748	233.3678	215.4100	203.4131	200.5916	207.7016	222.8380	241.9449	259.9028	259.9028	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	(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)													
-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	(71)
Water heating gains (Table 5)													
78.0541	75.9909	72.1147	65.6370	60.4581	53.4961	48.1142	53.6437	56.2138	63.1876	71.5555	77.8161	77.8161	(72)
Total internal gains													
469.3588	466.9713	451.3185	424.7674	396.5970	369.8858	353.2889	359.1427	373.4894	400.5365	431.8960	457.9058	457.9058	(73)

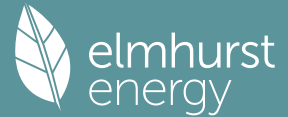
6. Solar gains

[Jan]													
					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d			Gains W	
North					4.0500	10.6334	0.5100	0.0000	0.7700			16.9117 (74)	
South					4.0500	46.7521	0.5100	0.0000	0.7700			74.3561 (78)	
Solar gains	91.2678	154.0953	210.0394	263.5333	301.5255	303.0306	290.5542	261.0554	228.0719	169.8188	109.0001	78.3490 (83)	
Total gains	560.6266	621.0667	661.3579	688.3007	698.1225	672.9165	643.8431	620.1981	601.5612	570.3553	540.8962	536.2548 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	39.4114	39.4644	39.5165	39.7632	39.8097	40.0275	40.0275	40.0682	39.9433	39.8097	39.7157	39.6180
alpha	3.6274	3.6310	3.6344	3.6509	3.6540	3.6685	3.6685	3.6712	3.6629	3.6540	3.6477	3.6412
util living area	0.9585	0.9391	0.9063	0.8437	0.7374	0.5832	0.4402	0.4733	0.6700	0.8552	0.9372	0.9639 (86)
MIT	19.5146	19.7352	20.0504	20.4222	20.7304	20.9166	20.9771	20.9698	20.8569	20.4766	19.9296	19.4586 (87)

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Th 2	20.0337	20.0349	20.0361	20.0415	20.0425	20.0472	20.0472	20.0481	20.0454	20.0425	20.0404	20.0383 (88)
util rest of house	0.9510	0.9283	0.8895	0.8152	0.6897	0.5110	0.3507	0.3830	0.6016	0.8230	0.9243	0.9573 (89)
MIT 2	18.3247	18.6006	18.9914	19.4441	19.7959	19.9880	20.0363	20.0327	19.9347	19.5186	18.8523	18.2579 (90)
Living area fraction									fLA = Living area / (4) =			0.3187 (91)
MIT	18.7039	18.9622	19.3289	19.7558	20.0937	20.2840	20.3361	20.3313	20.2286	19.8239	19.1956	18.6405 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7039	18.9622	19.3289	19.7558	20.0937	20.2840	20.3361	20.3313	20.2286	19.8239	19.1956	18.6405 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9377	0.9136	0.8749	0.8056	0.6924	0.5297	0.3785	0.4106	0.6156	0.8146	0.9102	0.9448	(94)
Useful gains	525.6964	567.3882	578.6442	554.5155	483.4040	356.4526	243.6695	254.6468	370.3172	464.5963	492.3091	506.6451	(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	972.4654	948.1157	863.8232	726.4358	561.0239	377.8394	248.3562	261.0680	408.2564	616.5102	810.3634	969.8536	(97)
Space heating kWh	332.3962	255.8488	212.1732	123.7827	57.7492	0.0000	0.0000	0.0000	0.0000	113.0239	228.9991	344.6271	(98a)
Space heating requirement - total per year (kWh/year)												1668.6002	
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	332.3962	255.8488	212.1732	123.7827	57.7492	0.0000	0.0000	0.0000	0.0000	113.0239	228.9991	344.6271	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1668.6002	
Space heating per m2											(98c) / (4) =	26.1947	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	332.3962	255.8488	212.1732	123.7827	57.7492	0.0000	0.0000	0.0000	0.0000	113.0239	228.9991	344.6271	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	332.3962	255.8488	212.1732	123.7827	57.7492	0.0000	0.0000	0.0000	0.0000	113.0239	228.9991	344.6271	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2													(213)
Water heating													
Water heating requirement	199.5240	173.3601	178.8282	153.3031	141.8460	121.1649	114.1294	130.0052	135.8014	161.6389	178.2015	199.4415	(64)
Efficiency of water heater (217)m	346.6091	346.6091	346.6091	346.6091	346.6091	346.6091	346.6091	346.6091	346.6091	346.6091	346.6091	346.6091	(216)
Fuel for water heating, kWh/month	57.5646	50.0160	51.5936	44.2294	40.9239	34.9572	32.9274	37.5077	39.1800	46.6343	51.4128	57.5408	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	24.6261	19.7560	17.7881	13.0323	10.0665	8.2244	9.1830	11.9364	15.5043	20.3424	22.9767	25.3105	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-11.8299	-18.4822	-29.1257	-35.2595	-39.1032	-34.8758	-34.4178	-31.3459	-26.3461	-21.6739	-13.5116	-10.0364	(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	0.3681	0.5697	0.5212	-0.6360	-3.0583	-5.7806	-5.7036	-4.7263	-3.3403	-0.2636	0.3160	0.3221	(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												1668.6002	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												346.6091	
Water heating fuel used												544.4877	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												198.7468	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-327.4197	(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												2084.4150	(238)

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10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1 (high-rate cost)	1668.6002	19.6000	327.0456 (240)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (240)
Space heating - main system 2 (1.00*19.60 + 0.00*9.40)	0.0000	19.6000	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (electric off-peak tariff)			
High-rate fraction			0.0405 (243)
Low-rate fraction			0.9595 (244)
High-rate cost	22.0417	19.6000	4.3202 (245)
Low-rate cost	522.4460	9.4000	49.1099 (246)
Energy for instantaneous electric shower(s)	0.0000	18.5800	0.0000 (247a)
Pumps, fans and electric keep-hot (0.90*19.60 + 0.10*9.40)	0.0000	0.0000	0.0000 (249)
Energy for lighting (0.90*19.60 + 0.10*9.40)	198.7468	18.5800	36.9272 (250)
Additional standing charges			7.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-306.0080	18.5800	-56.8563
PV Unit electricity exported	-21.4117	5.5900	-1.1969
Total			-58.0532 (252)
Total energy cost			366.3497 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.2133 (257)
SAP value		80.3324
SAP rating (Section 12)		80 (258)
SAP band		C

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 (high-rate cost)	1668.6002	0.1629	271.7945 (261)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (261)
Space heating - main system 2 (high-rate cost)	0.0000	0.0000	0.0000 (262)
Space heating - main system 2 (low-rate cost)	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating - high rate cost	22.0417	0.1490	3.2842 (264)
Water heating - low rate cost	522.4460	0.1251	65.3355 (264)
Space and water heating			340.4143 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	198.7468	0.1490	29.6172 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-306.0080	0.1380	-42.2201
PV Unit electricity exported	-21.4117	0.0973	-2.0842
Total			-44.3043 (269)
Total CO2, kg/year			325.7272 (272)
CO2 emissions per m2			5.1100 (273)
EI value			95.9846
EI rating			96 (274)
EI band			A

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

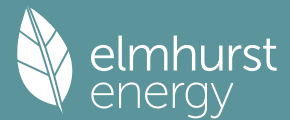
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	6.0000 (1b)	x 2.4000 (2b)	= 14.4000 (1b) - (3b)
First floor	57.7000 (1c)	x 2.4000 (2c)	= 138.4800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	152.8800 (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) = 0.1308 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)

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Infiltration rate													0.2808 (18)
Number of sides sheltered													2 (19)
Shelter factor													(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor													(21) = (18) x (20) = 0.2387 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	3.8000	3.5000	3.7000	3.4000	3.5000	3.0000	3.1000	3.0000	3.0000	3.2000	3.1000	3.5000	(22)
Adj infilt rate	0.9500	0.8750	0.9250	0.8500	0.8750	0.7500	0.7750	0.7500	0.7500	0.8000	0.7750	0.8750	(22a)
Effective ac	0.2268	0.2089	0.2208	0.2029	0.2089	0.1790	0.1850	0.1790	0.1790	0.1910	0.1850	0.2089	(22b)
	0.5257	0.5218	0.5244	0.5206	0.5218	0.5160	0.5171	0.5160	0.5160	0.5182	0.5171	0.5218	(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								
Ent Door			1.9600	1.1000	2.1560			(26a)
Windows			8.1000	1.0536	8.5345			(27)
Heatloss Floor 1			6.0000	0.1200	0.7200	75.0000	450.0000	(28a)
External Wall 1	66.7200	10.0600	56.6600	0.2000	11.3320	60.0000	3399.6000	(29a)
Planned Roof	57.7000		57.7000	0.0900	5.1930	9.0000	519.3000	(30)
Total net area of external elements Aum(A, m2)			130.4200					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 27.9355			(33)
Main dwelling								
Party Wall 1			36.9600	0.0000	0.0000	70.0000	2587.2000	(32)
Party Floor 1			49.7000			30.0000	1491.0000	(32d)
Internal Wall 1			113.7600			9.0000	1023.8400	(32c)
Internal Floor 1			6.0000			18.0000	108.0000	(32d)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) = 9578.9400		(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							150.3758	(35)

List of Thermal Bridges													
K1 Element													
E16 Corner (normal)													
P1 Party wall - Ground floor													
E2 Other lintels (including other steel lintels)													
E3 Sill													
E4 Jamb													
E6 Intermediate floor within a dwelling													
E7 Party floor between dwellings (in blocks of flats)													
E18 Party wall between dwellings													
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)													
P4 Party wall - Roof (insulation at ceiling level)													
E10 Eaves (insulation at ceiling level)													
Thermal bridges (Sum(L x Psi) calculated using Appendix K)													12.0168 (36)
Point Thermal bridges													(36a) = 0.0000
Total fabric heat loss													(33) + (36) + (36a) = 39.9523 (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	26.5223	26.3256	26.4549	26.2636	26.3256	26.0337	26.0885	26.0337	26.0337	26.1450	26.0885	26.3256	(38)
Average = Sum(39)m / 12 =	66.4746	66.2779	66.4073	66.2159	66.2779	65.9860	66.0408	65.9860	65.9860	66.0974	66.0408	66.2779	(39)
													66.1724

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0436	1.0405	1.0425	1.0395	1.0405	1.0359	1.0367	1.0359	1.0359	1.0376	1.0367	1.0405	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

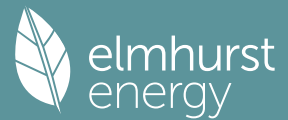
Assumed occupancy													2.0841 (42)
Hot water usage for mixer showers													
Hot water usage for baths													
Hot water usage for other uses													
Average daily hot water use (litres/day)													109.0449 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	118.6365	116.0682	112.9221	108.8086	104.9826	100.1683	97.4272	101.9804	104.9409	109.7222	114.6456	118.5647	(44)
Energy content (annual)	174.6534	153.5817	161.3634	142.1312	135.2807	115.8412	107.6600	120.0329	121.7262	141.3882	154.9474	174.1209	(45)
Distribution loss (46)m = 0.15 x (45)m													Total = Sum(45)m = 1702.7271
	26.1980	23.0373	24.2045	21.3197	20.2921	17.3762	16.1490	18.0049	18.2589	21.2082	23.2421	26.1181	(46)

Water storage loss:													
Store volume													201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6100 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8694 (55)
Total storage loss													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
WWHRS	201.6048	177.9249	188.3148	168.2132	162.2321	141.9232	134.6114	146.9843	147.8082	168.3396	181.0294	201.0723	(62)
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	(63a)
Solar input	-2.6909	-4.8570	-9.9995	-16.0669	-21.0595	-23.1841	-22.7025	-19.4690	-13.6869	-7.8817	-3.5742	-2.1273	(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)
	198.9139	173.0679	178.3153	152.1463	141.1726	118.7391	111.9089	127.5152	134.1213	160.4579	177.4551	198.9450	(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													

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58.0723 51.0659 53.6533 47.2586 44.9808 38.5172 35.7969 39.9109 40.4740 47.0116 51.5200 57.8952 (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	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.1347	24.9890	20.3224	15.3854	11.5007	9.7094	10.4914	13.6371	18.3036	23.2407	27.1253	28.9166	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	271.8997	274.7212	267.6112	252.4748	233.3678	215.4100	203.4131	200.5916	207.7016	222.8380	241.9449	259.9028	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	(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)	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	(71)
Water heating gains (Table 5)	78.0541	75.9909	72.1147	65.6370	60.4581	53.4961	48.1142	53.6437	56.2138	63.1876	71.5555	77.8161	(72)
Total internal gains	469.3588	466.9713	451.3185	424.7674	396.5970	369.8858	353.2889	359.1427	373.4894	400.5365	431.8960	457.9058	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W	
North					4.0500	12.7650	0.5100	0.0000			0.7700			20.3020 (74)	
South					4.0500	54.2217	0.5100	0.0000			0.7700			86.2361 (78)	
Solar gains	106.5381	157.2805	213.7331	274.6425	306.9440	327.4679	311.9001	285.5992	246.2680	186.2338	125.3438			91.9963 (83)	
Total gains	575.8968	624.2518	665.0516	699.4099	703.5410	697.3538	665.1890	644.7419	619.7574	586.7703	557.2399	549.9021			(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)													21.0000 (85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	40.0275	40.1464	40.0682	40.1839	40.1464	40.3240	40.2905	40.3240	40.3240	40.2560	40.2905	40.1464	
alpha	3.6685	3.6764	3.6712	3.6789	3.6764	3.6883	3.6860	3.6883	3.6883	3.6837	3.6860	3.6764	
util living area	0.9488	0.9304	0.8873	0.8087	0.6809	0.4811	0.3334	0.3530	0.6036	0.8161	0.9210	0.9556	(86)
MIT	19.6923	19.8701	20.2083	20.5545	20.8202	20.9639	20.9931	20.9914	20.9112	20.6058	20.0918	19.6296	(87)
Th 2	20.0472	20.0497	20.0481	20.0505	20.0497	20.0535	20.0528	20.0535	20.0535	20.0521	20.0528	20.0497	(88)
util rest of house	0.9394	0.9180	0.8669	0.7743	0.6252	0.4026	0.2425	0.2600	0.5284	0.7763	0.9047	0.9474	(89)
MIT 2	18.5572	18.7792	19.1933	19.6050	19.8963	20.0324	20.0506	20.0507	19.9912	19.6739	19.0612	18.4810	(90)
Living area fraction	18.9190	19.1269	19.5168	19.9076	20.1907	20.3292	20.3510	20.3505	20.2844	19.9709	19.3897	18.8470	(91)
MIT	18.9190	19.1269	19.5168	19.9076	20.1907	20.3292	20.3510	20.3505	20.2844	19.9709	19.3897	18.8470	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9190	19.1269	19.5168	19.9076	20.1907	20.3292	20.3510	20.3505	20.2844	19.9709	19.3897	18.8470	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9255	0.9034	0.8537	0.7686	0.6340	0.4261	0.2715	0.2895	0.5476	0.7725	0.8909	0.9342	(94)
Useful gains	533.0203	563.9471	567.7877	537.5921	446.0261	297.1157	180.5696	186.6694	339.3822	453.2604	496.4684	513.7064	(95)
Ext temp.	5.0000	5.5000	7.4000	9.8000	12.7000	15.7000	17.6000	17.5000	14.8000	11.4000	7.8000	4.9000	(96)
Heat loss rate W	925.2580	903.1602	804.6411	669.2836	496.4699	305.4642	181.6766	188.0905	361.8912	566.5120	765.3903	924.3812	(97)
Space heating kWh	291.8249	227.9512	176.2189	94.8178	37.5302	0.0000	0.0000	0.0000	0.0000	84.2592	193.6237	305.5421	(98a)
Space heating requirement - total per year (kWh/year)												1411.7680	
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	291.8249	227.9512	176.2189	94.8178	37.5302	0.0000	0.0000	0.0000	0.0000	84.2592	193.6237	305.5421	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1411.7680	
Space heating per m ²										(98c) / (4) =		22.1628	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	291.8249	227.9512	176.2189	94.8178	37.5302	0.0000	0.0000	0.0000	0.0000	84.2592	193.6237	305.5421	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	291.8249	227.9512	176.2189	94.8178	37.5302	0.0000	0.0000	0.0000	0.0000	84.2592	193.6237	305.5421	(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)

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Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Space heating fuel used, main system 2												0.0000 (213)
Water heating												
Water heating requirement	198.9139	173.0679	178.3153	152.1463	141.1726	118.7391	111.9089	127.5152	134.1213	160.4579	177.4551	198.9450 (64)
Efficiency of water heater (217)m	346.6091	346.6091	346.6091	346.6091	346.6091	346.6091	346.6091	346.6091	346.6091	346.6091	346.6091	346.6091 (216)
Fuel for water heating, kWh/month	57.3885	49.9317	51.4456	43.8956	40.7296	34.2574	32.2868	36.7893	38.6953	46.2936	51.1975	57.3975 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	24.6261	19.7560	17.7881	13.0323	10.0665	8.2244	9.1830	11.9364	15.5043	20.3424	22.9767	25.3105 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-13.8342	-19.0733	-29.6672	-36.0943	-38.9406	-36.8573	-36.2366	-33.6203	-28.2515	-23.4826	-15.4977	-11.8214 (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	0.3792	0.4677	0.1458	-1.4092	-4.0199	-6.4577	-6.3234	-5.4209	-3.8084	-0.7082	0.2481	0.3479 (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												1411.7680 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												346.6091
Water heating fuel used												540.3085 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												198.7468 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-349.9360 (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												1800.8874 (238)

10a. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1 (high-rate cost)	1411.7680	34.6000	488.4717 (240)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (240)
Space heating - main system 2 (1.00*34.60 + 0.00*15.80)	0.0000	34.6000	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (electric off-peak tariff)			
High-rate fraction			0.0405 (243)
Low-rate fraction			0.9595 (244)
High-rate cost	21.8725	34.6000	7.5679 (245)
Low-rate cost	518.4360	15.8000	81.9129 (246)
Energy for instantaneous electric shower(s)	0.0000	32.7200	0.0000 (247a)
Pumps, fans and electric keep-hot (0.90*34.60 + 0.10*15.80)	0.0000	0.0000	0.0000 (249)
Energy for lighting (0.90*34.60 + 0.10*15.80)	198.7468	32.7200	65.0299 (250)
Additional standing charges			8.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-323.3770	32.7200	-105.8089
PV Unit electricity exported	-26.5590	5.8100	-1.5431
Total			-107.3520 (252)
Total energy cost			543.6304 (255)

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 (high-rate cost)	1411.7680	0.1635	230.8603 (261)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (261)
Space heating - main system 2 (high-rate cost)	0.0000	0.0000	0.0000 (262)
Space heating - main system 2 (low-rate cost)	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating - high rate cost	21.8725	0.1491	3.2615 (264)
Water heating - low rate cost	518.4360	0.1252	64.8836 (264)
Space and water heating			299.0053 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	198.7468	0.1490	29.6172 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-323.3770	0.1381	-44.6626
PV Unit electricity exported	-26.5590	0.1025	-2.7221
Total			-47.3846 (269)
Total CO2, kg/year			281.2379 (272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
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Space heating - main system 1 (high-rate cost)	1411.7680	1.6096	2272.3745 (275)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (275)
Space heating - main system 2 (high-rate cost)	0.0000	0.0000	0.0000 (276)
Space heating - main system 2 (low-rate cost)	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating - high rate cost	21.8725	1.5573	34.0613 (278)
Water heating - low rate cost	518.4360	1.4483	750.8581 (278)
Space and water heating			3057.2938 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	198.7468	1.5547	309.0005 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-323.3770	1.5149	-489.8879
PV Unit electricity exported	-26.5590	0.3747	-9.9509
Total			-499.8388 (283)
Total Primary energy kWh/year			2866.4555 (286)

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Property Reference	P3 Ladds			Issued on Date	27/08/2025
Assessment Reference	1st Flr Flat elec	Prop Type Ref	Semi		
Property	1, Bath Road, Hare Hatch, Berkshire, RG10 9SA				
SAP Rating	82 B	DER	5.58	TER	11.74
Environmental	96 A	% DER < TER			52.47
CO ₂ Emissions (t/year)	0.28	DFEE	32.50	TFEE	31.61
Compliance Check	See BREL	% DFEE < TFEE			-2.80
% DPER < TPER	5.39	DPER	58.12	TPER	61.43
Assessor Details	Mrs. Naomi Sadler			Assessor ID	4611-0001
Client	Westbourne Homes, Westbourne Homes				

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	6.0000 (1b)	x 2.4000 (2b)	= 14.4000 (1b) - (3b)
First floor	57.7000 (1c)	x 2.4000 (2c)	= 138.4800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 152.8800 (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	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) = 0.1308 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2808 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2387 (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	0.3043	0.2984	0.2924	0.2626	0.2566	0.2268	0.2268	0.2208	0.2387	0.2566	0.2685	0.2805 (22b)
Effective ac	0.5463	0.5445	0.5428	0.5345	0.5329	0.5257	0.5257	0.5244	0.5285	0.5329	0.5361	0.5393 (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							
Ent Door			1.9600	1.1000	2.1560		(26a)
Windows			8.1000	1.0536	8.5345		(27)
Heatloss Floor 1			6.0000	0.1200	0.7200	75.0000	450.0000 (28a)
External Wall 1	66.7200	10.0600	56.6600	0.2000	11.3320	60.0000	3399.6000 (29a)
Planned Roof	57.7000		57.7000	0.0900	5.1930	9.0000	519.3000 (30)
Total net area of external elements Aum(A, m ²)			130.4200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.9355		(33)
Main dwelling							
Party Wall 1			36.9600	0.0000	0.0000	70.0000	2587.2000 (32)
Party Floor 1			49.7000			30.0000	1491.0000 (32d)
Internal Wall 1			113.7600			9.0000	1023.8400 (32c)
Internal Floor 1			6.0000			18.0000	108.0000 (32d)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9578.9400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							150.3758 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E16 Corner (normal)				7.2000	0.0570	0.4104	
P1 Party wall - Ground floor				6.0000	0.3200	1.9200	

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E2 Other lintels (including other steel lintels)						6.9300			0.0480			0.3326
E3 Sill						6.0000			0.0450			0.2700
E4 Jamb						15.0000			0.0510			0.7650
E6 Intermediate floor within a dwelling						6.1000			0.0000			0.0000
E7 Party floor between dwellings (in blocks of flats)						21.7000			0.0640			1.3888
E18 Party wall between dwellings						9.6000			0.0620			0.5952
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)						9.4000			0.0000			0.0000
P4 Party wall - Roof (insulation at ceiling level)						9.4000			0.4800			4.5120
E10 Eaves (insulation at ceiling level)						21.7000			0.0840			1.8228
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												12.0168 (36)
Point Thermal Bridges												0.0000
Total fabric heat loss									(33) + (36) + (36a) =			39.9523 (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	27.5616	27.4709	27.3820	26.9643	26.8861	26.5223	26.5223	26.4549	26.6625	26.8861	27.0442	27.2095 (38)
Average = Sum(39)m / 12 =	67.5140	67.4232	67.3343	66.9166	66.8384	66.4746	66.4746	66.4073	66.6148	66.8384	66.9965	67.1618 (39)
												66.9162
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0599	1.0584	1.0571	1.0505	1.0493	1.0436	1.0436	1.0425	1.0458	1.0493	1.0518	1.0543 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31
												1.0505
												31

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.0841 (42)
Hot water usage for mixer showers												
	57.6681	56.7852	55.4841	53.4825	51.6891	49.1801	47.1957	49.5156	50.6824	53.1674	55.7553	57.6161 (42a)
Hot water usage for baths												
	24.9953	24.6180	24.0812	23.2773	22.5529	21.5556	20.7990	21.7242	22.2097	23.1979	24.2253	24.9754 (42b)
Hot water usage for other uses												
	35.9731	34.6650	33.3569	32.0488	30.7407	29.4325	29.4325	30.7407	32.0488	33.3569	34.6650	35.9731 (42c)
Average daily hot water use (litres/day)												109.0449 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	118.6365	116.0682	112.9221	108.8086	104.9826	100.1683	97.4272	101.9804	104.9409	109.7222	114.6456	118.5647 (44)
Energy conte	174.6534	153.5817	161.3634	142.1312	135.2807	115.8412	107.6600	120.0329	121.7262	141.3882	154.9474	174.1209 (45)
Energy content (annual)										Total = Sum(45)m =		1702.7271
Distribution loss (46)m = 0.15 x (45)m	26.1980	23.0373	24.2045	21.3197	20.2921	17.3762	16.1490	18.0049	18.2589	21.2082	23.2421	26.1181 (46)
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.9700 (48)
Temperature factor from Table 2b												0.6000 (49)
Enter (49) or (54) in (55)												0.5820 (55)
Total storage loss	18.0420	16.2960	18.0420	17.4600	18.0420	17.4600	18.0420	18.0420	17.4600	18.0420	17.4600	18.0420 (56)
If cylinder contains dedicated solar storage	18.0420	16.2960	18.0420	17.4600	18.0420	17.4600	18.0420	18.0420	17.4600	18.0420	17.4600	18.0420 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	192.6954	169.8777	179.4054	159.5912	153.3227	133.3012	125.7020	138.0749	139.1862	159.4302	172.4074	192.1629 (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	-13.0777	-27.7222	-55.7491	-84.8059	-113.1361	-114.1607	-112.6728	-94.6447	-68.5683	-39.8030	-17.4913	-10.3162 (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	179.6177	142.1554	123.6564	74.7852	40.1867	19.1406	13.0291	43.4302	70.6179	119.6272	154.9161	181.8467 (64)
									Total per year (kWh/year) = Sum(64)m =			1163.0091 (64)
12Total per year (kWh/year)												1163 (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)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												
Heat gains from water heating, kWh/month	58.0723	51.0659	53.6533	47.2586	44.9808	38.5172	35.7969	39.9109	40.4740	47.0116	51.5200	57.8952 (65)

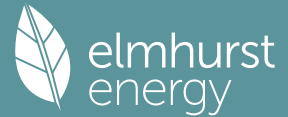
5. Internal gains (see Table 5 and 5a)												

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	100.6872	111.4751	100.6872	104.0435	100.6872	104.0435	100.6872	100.6872	104.0435	100.6872	104.0435	100.6872 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	182.1728	184.0632	179.2995	169.1581	156.3565	144.3247	136.2868	134.3964	139.1601	149.3014	162.1031	174.1348 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204 (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)	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634 (71)
Water heating gains (Table 5)	78.0541	75.9909	72.1147	65.6370	60.4581	53.4961	48.1142	53.6437	56.2138	63.1876	71.5555	77.8161 (72)
Total internal gains	415.1754	425.7905	406.3627	393.0998	371.7631	356.1256	339.3494	342.9886	353.6787	367.4375	391.9634	406.8995 (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				4.0500	10.6334	0.5100	0.0000	0.7700				16.9117 (74)
South				4.0500	46.7521	0.5100	0.0000	0.7700				74.3561 (78)
Solar gains	91.2678	154.0953	210.0394	263.5333	301.5255	303.0306	290.5542	261.0554	228.0719	169.8188	109.0001	78.3490 (83)
Total gains	506.4432	579.8859	616.4021	656.6331	673.2885	659.1562	629.9036	604.0440	581.7505	537.2563	500.9635	485.2485 (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	39.4114	39.4644	39.5165	39.7632	39.8097	40.0275	40.0275	40.0682	39.9433	39.8097	39.7157	39.6180
alpha	3.6274	3.6310	3.6344	3.6509	3.6540	3.6685	3.6685	3.6712	3.6629	3.6540	3.6477	3.6412
util living area	0.9690	0.9494	0.9214	0.8587	0.7527	0.5927	0.4490	0.4844	0.6851	0.8732	0.9490	0.9731 (86)
MIT	19.3973	19.6529	19.9712	20.3796	20.7102	20.9121	20.9756	20.9674	20.8457	20.4295	19.8501	19.3459 (87)
Th 2	20.0337	20.0349	20.0361	20.0415	20.0425	20.0472	20.0472	20.0481	20.0454	20.0425	20.0404	20.0383 (88)
util rest of house	0.9632	0.9402	0.9066	0.8318	0.7059	0.5201	0.3581	0.3925	0.6170	0.8434	0.9381	0.9680 (89)
MIT 2	18.1783	18.4993	18.8963	19.3959	19.7757	19.9846	20.0355	20.0314	19.9251	19.4659	18.7552	18.1167 (90)
Living area fraction	fLA = Living area / (4) = 0.3187 (91)											
MIT	18.5668	18.8669	19.2389	19.7094	20.0735	20.2802	20.3351	20.3297	20.2185	19.7730	19.1041	18.5084 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.5668	18.8669	19.2389	19.7094	20.0735	20.2802	20.3351	20.3297	20.2185	19.7730	19.1041	18.5084 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9515	0.9261	0.8920	0.8212	0.7075	0.5386	0.3862	0.4205	0.6302	0.8337	0.9246	0.9571 (94)
Useful gains	481.8662	537.0349	549.8090	539.2495	476.3478	355.0220	243.2798	254.0172	366.6429	447.9110	463.1741	464.4182 (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	963.2055	941.6947	857.7635	723.3292	559.6724	377.5860	248.2886	260.9588	407.5820	613.1070	804.2343	960.9810 (97)
Space heating kWh	358.1164	271.9313	229.1182	132.5374	61.9935	0.0000	0.0000	0.0000	0.0000	122.9058	245.5633	369.4428 (98a)
Space heating requirement - total per year (kWh/year)	1791.6087											
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	358.1164	271.9313	229.1182	132.5374	61.9935	0.0000	0.0000	0.0000	0.0000	122.9058	245.5633	369.4428 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1791.6087											
Space heating per m2	(98c) / (4) = 28.1257 (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 %)	100.0000 (206)											
Efficiency of main space heating system 2 (in %)	0.0000 (207)											
Efficiency of secondary/supplementary heating system, %	0.0000 (208)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	358.1164	271.9313	229.1182	132.5374	61.9935	0.0000	0.0000	0.0000	0.0000	122.9058	245.5633	369.4428 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	358.1164	271.9313	229.1182	132.5374	61.9935	0.0000	0.0000	0.0000	0.0000	122.9058	245.5633	369.4428 (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	179.6177	142.1554	123.6564	74.7852	40.1867	19.1406	13.0291	43.4302	70.6179	119.6272	154.9161	181.8467 (64)
Efficiency of water heater	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month	179.6177	142.1554	123.6564	74.7852	40.1867	19.1406	13.0291	43.4302	70.6179	119.6272	154.9161	181.8467 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	24.6261	19.7560	17.7881	13.0323	10.0665	8.2244	9.1830	11.9364	15.5043	20.3424	22.9767	25.3105 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-37.6056	-55.3016	-81.3649	-89.4708	-89.4021	-72.0672	-71.0850	-67.5327	-60.7898	-60.0160	-41.4952	-32.2865 (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	2.0499	2.5241	0.9621	-7.0724	-20.5740	-32.8014	-32.3745	-27.0805	-19.4863	-2.6043	1.5202	1.8351 (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	1791.6087 (211)											
Space heating fuel - main system 2	0.0000 (213)											
Space heating fuel - secondary	0.0000 (215)											
Efficiency of water heater	100.0000											
Water heating fuel used	1163.0091 (219)											
Space cooling fuel	0.0000 (221)											
Electricity for pumps and fans:												
Total electricity for the above, kWh/year	0.0000 (231)											
Electricity for lighting (calculated in Appendix L)	198.7468 (232)											
Energy saving/generation technologies (Appendices M ,N and O)												

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PV generation	-891.5194 (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	2261.8452 (238)

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

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1 (high-rate cost)	1791.6087	0.1629	291.7953 (261)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (261)
Total CO ₂ associated with community systems			0.0000 (373)
Water heating - high rate cost	47.0804	0.1565	7.3688 (264)
Water heating - low rate cost	1115.9288	0.1314	146.6094 (264)
Space and water heating			445.7736 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	198.7468	0.1490	29.6172 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-758.4174	0.1405	-106.5722
PV Unit electricity exported	-133.1020	0.1018	-13.5447
Total			-120.1170 (269)
Total CO ₂ , kg/year			355.2738 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.5800 (273)

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

	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1 (high-rate cost)	1791.6087	1.6072	2879.5287 (275)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating - high rate cost	47.0804	1.5841	74.5792 (278)
Water heating - low rate cost	1115.9288	1.4733	1644.0989 (278)
Space and water heating			4598.2067 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	198.7468	1.5547	309.0005 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-758.4174	1.5237	-1155.6379
PV Unit electricity exported	-133.1020	0.3719	-49.5045
Total			-1205.1424 (283)
Total Primary energy kWh/year			3702.0648 (286)
Dwelling Primary energy Rate (DPER)			58.1200 (287)

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

1. Overall dwelling characteristics

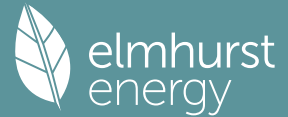
	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	6.0000 (1b)	x 2.4000 (2b)	= 14.4000 (1b) - (3b)
First floor	57.7000 (1c)	x 2.4000 (2c)	= 138.4800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 152.8800 (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	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) = 0.1308 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3808 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3237 (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)

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Adj infilt rate	0.4127	0.4046	0.3965	0.3561	0.3480	0.3075	0.3075	0.2994	0.3237	0.3480	0.3642	0.3803 (22b)
Effective ac	0.5852	0.5819	0.5786	0.5634	0.5605	0.5473	0.5473	0.5448	0.5524	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 Semi-glazed door			1.9600	1.0000	1.9600			(26a)
TER Opening Type			8.1000	1.1450	9.2748			(27)
Heatloss Floor 1			6.0000	0.1300	0.7800			(28a)
External Wall 1	66.7200	10.0600	56.6600	0.1800	10.1988			(29a)
Planned Roof	57.7000		57.7000	0.1100	6.3470			(30)
Total net area of external elements Aum(A, m2)			130.4200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	28.5606			(33)
Main dwelling								
Party Wall 1			36.9600	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								150.3758 (35)
List of Thermal Bridges								
K1 Element				Length	Psi-value		Total	
E16 Corner (normal)				7.2000	0.0900		0.6480	
P1 Party wall - Ground floor				6.0000	0.0800		0.4800	
E2 Other lintels (including other steel lintels)				6.9300	0.0500		0.3465	
E3 Sill				6.0000	0.0500		0.3000	
E4 Jamb				15.0000	0.0500		0.7500	
E6 Intermediate floor within a dwelling				6.1000	0.0000		0.0000	
E7 Party floor between dwellings (in blocks of flats)				21.7000	0.0700		1.5190	
E18 Party wall between dwellings				9.6000	0.0600		0.5760	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				9.4000	0.0000		0.0000	
P4 Party wall - Roof (insulation at ceiling level)				9.4000	0.1200		1.1280	
E10 Eaves (insulation at ceiling level)				21.7000	0.0600		1.3020	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								7.0495 (36)
Point Thermal bridges							(36a) =	0.0000
Total fabric heat loss							(33) + (36) + (36a) =	35.6101 (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	29.5219	29.3551	29.1915	28.4234	28.2796	27.6106	27.6106	27.4867	27.8683	28.2796	28.5704	28.8743	(38)
Average = Sum(39)m / 12 =	65.1320	64.9652	64.8016	64.0335	63.8898	63.2207	63.2207	63.0968	63.4784	63.8898	64.1805	64.4845	(39)
												64.0328	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0225	1.0199	1.0173	1.0052	1.0030	0.9925	0.9925	0.9905	0.9965	1.0030	1.0075	1.0123	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

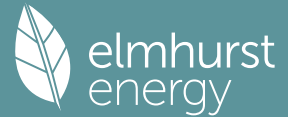
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.0841 (42)
Hot water usage for mixer showers													
Hot water usage for baths	59.1629	58.2737	56.9781	54.4993	52.6699	50.6298	49.4702	50.7560	52.1655	54.3559	56.8881	58.9362	(42a)
Hot water usage for other uses	25.5652	25.1855	24.6508	23.6650	22.9268	22.1083	21.6662	22.1971	22.7752	23.6510	24.6572	25.4788	(42b)
Average daily hot water use (litres/day)	35.9731	34.6650	33.3569	32.0488	30.7407	29.4325	29.4325	30.7407	32.0488	33.3569	34.6650	35.9731	(42c)
												110.9520	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	120.7012	118.1243	114.9859	110.2130	106.3374	102.1707	100.5690	103.6938	106.9895	111.3639	116.2102	120.3880	(44)
Energy content (annual)	191.1611	168.2074	176.7290	150.8761	143.1506	125.6308	121.6294	128.3946	131.9287	151.1197	165.5628	188.4986	(45)
Distribution loss (46)m = 0.15 x (45)m	28.6742	25.2311	26.5094	22.6314	21.4726	18.8446	18.2444	19.2592	19.7893	22.6680	24.8344	28.2748	(46)
Water storage loss:													
Store volume													201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6575 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8950 (55)
Total storage loss	27.7463	25.0612	27.7463	26.8513	27.7463	26.8513	27.7463	27.7463	26.8513	27.7463	26.8513	27.7463	(56)
If cylinder contains dedicated solar storage	27.7463	25.0612	27.7463	26.8513	27.7463	26.8513	27.7463	27.7463	26.8513	27.7463	26.8513	27.7463	(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	242.1699	214.2798	227.7377	200.2394	194.1593	174.9941	172.6382	179.4033	181.2920	202.1284	214.9261	239.5073	(62)
WWHRS	-27.0468	-23.9204	-25.0481	-20.7408	-19.3297	-16.5405	-15.5041	-16.4871	-17.1135	-20.1749	-22.8557	-26.5459	(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	215.1231	190.3594	202.6897	179.4987	174.8296	158.4535	157.1341	162.9162	164.1785	181.9535	192.0704	212.9614	(64)
Total per year (kWh/year)													2192.1680 (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	104.3681	92.7869	99.5694	89.6569	88.4045	81.2629	81.2488	83.4982	83.3569	91.0543	94.5403	103.4828	(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	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	100.6872	111.4751	100.6872	104.0435	100.6872	104.0435	100.6872	100.6872	104.0435	100.6872	104.0435	100.6872	(67)

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Cooking gains	182.1728	184.0632	179.2995	169.1581	156.3565	144.3247	136.2868	134.3964	139.1601	149.3014	162.1031	174.1348 (68)
	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204 (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)											
	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634 (71)
Water heating gains	(Table 5)											
	140.2796	138.0757	133.8298	124.5235	118.8233	112.8651	109.2053	112.2287	115.7735	122.3848	131.3059	139.0897 (72)
Total internal gains	480.4009	490.8753	471.0778	454.9864	433.1283	415.4945	400.4406	401.5736	413.2383	429.6347	454.7137	471.1731 (73)

6. Solar gains

[Jan]													
					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c	Access factor Table 6d		Gains W	
North					4.0500	10.6334	0.6300		0.7000	0.7700		13.1613 (74)	
South					4.0500	46.7521	0.6300		0.7000	0.7700		57.8666 (78)	
Solar gains	71.0279	119.9224	163.4601	205.0909	234.6578	235.8291	226.1195	203.1625	177.4936	132.1590	84.8278	60.9739 (83)	
Total gains	551.4288	610.7977	634.5378	660.0773	667.7860	651.3237	626.5601	604.7361	590.7319	561.7937	539.5415	532.1470 (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	40.8527	40.9576	41.0610	41.5535	41.6470	42.0877	42.0877	42.1704	41.9169	41.6470	41.4583	41.2629	
alpha	3.7235	3.7305	3.7374	3.7702	3.7765	3.8058	3.8058	3.8114	3.7945	3.7765	3.7639	3.7509	
util living area	0.9590	0.9393	0.9113	0.8486	0.7422	0.5784	0.4325	0.4643	0.6606	0.8513	0.9345	0.9634 (86)	
MIT	19.5788	19.7983	20.0798	20.4515	20.7480	20.9286	20.9816	20.9757	20.8776	20.5240	20.0095	19.5447 (87)	
Th 2	20.0646	20.0668	20.0689	20.0790	20.0809	20.0896	20.0896	20.0912	20.0862	20.0809	20.0771	20.0731 (88)	
util rest of house	0.9517	0.9287	0.8955	0.8211	0.6960	0.5090	0.3478	0.3788	0.5943	0.8193	0.9213	0.9568 (89)	
MIT 2	18.4266	18.7017	19.0524	19.5091	19.8489	20.0385	20.0807	20.0787	19.9913	19.6037	18.9768	18.3897 (90)	
Living area fraction	FLA = Living area / (4) =												0.3187 (91)
MIT	18.7938	19.0511	19.3798	19.8094	20.1354	20.3222	20.3678	20.3645	20.2737	19.8970	19.3059	18.7578 (92)	
Temperature adjustment													0.0000
adjusted MIT	18.7938	19.0511	19.3798	19.8094	20.1354	20.3222	20.3678	20.3645	20.2737	19.8970	19.3059	18.7578 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9390	0.9147	0.8816	0.8122	0.6989	0.5274	0.3742	0.4051	0.6087	0.8121	0.9079	0.9448 (94)	
Useful gains	517.7970	558.6681	559.4207	536.0859	466.7170	343.5219	234.4453	245.0041	359.5802	456.2194	489.8682	502.7495 (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	944.0083	919.3308	834.6313	698.5677	538.9378	361.7595	238.2026	250.1501	391.8979	593.9813	783.3815	938.7516 (97)	
Space heating kWh	317.1012	242.3653	204.7567	116.9869	53.7323	0.0000	0.0000	0.0000	0.0000	102.4948	211.3296	324.3856 (98a)	
Space heating requirement - total per year (kWh/year)	1573.1524												
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	317.1012	242.3653	204.7567	116.9869	53.7323	0.0000	0.0000	0.0000	0.0000	102.4948	211.3296	324.3856 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)	1573.1524												
Space heating per m ²	(98c) / (4) = 24.6963 (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	317.1012	242.3653	204.7567	116.9869	53.7323	0.0000	0.0000	0.0000	0.0000	102.4948	211.3296	324.3856 (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)	343.5549	262.5843	221.8382	126.7464	58.2148	0.0000	0.0000	0.0000	0.0000	111.0453	228.9595	351.4470 (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	215.1231	190.3594	202.6897	179.4987	174.8296	158.4535	157.1341	162.9162	164.1785	181.9535	192.0704	212.9614 (64)
Efficiency of water heater	84.9284	84.6025	84.0826	83.1242	81.7478	79.8000	79.8000	79.8000	79.8000	82.8247	84.2746	79.8000 (216)
(217)m	84.9284	84.6025	84.0826	83.1242	81.7478	79.8000	79.8000	79.8000	79.8000	82.8247	84.2746	85.0007 (217)
Fuel for water heating, kWh/month	253.2992	225.0043	241.0603	215.9402	213.8647	198.5633	196.9099	204.1557	205.7375	219.6850	227.9102	250.5409 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	20.9208	16.7835	15.1116	11.0714	8.5519	6.9870	7.8013	10.1405	13.1715	17.2817	19.5196	21.5023 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-30.0933	-42.5709	-61.4019	-69.2951	-74.9596	-70.0805	-69.2524	-65.2902	-58.2892	-48.8425	-33.1510	-26.0035 (233a)

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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	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	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	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)														
(233b)m	-16.5414	-34.8579	-69.3866	-104.3520	-138.0960	-138.7705	-137.1002	-115.9930	-84.9270	-49.8504	-22.0882	-13.0726		(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	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													1704.3904	(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													2652.6712	(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)													168.8430	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-1574.2660	(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													3037.6386	(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	1704.3904	0.2100	357.9220	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2652.6712	0.2100	557.0610	(264)
Space and water heating			914.9829	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	168.8430	0.1443	24.3693	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-649.2301	0.1345	-87.3223	
PV Unit electricity exported	-925.0360	0.1259	-116.4278	
Total			-203.7501	(269)
Total CO2, kg/year			747.5313	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.7400	(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	1704.3904	1.1300	1925.9612	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2652.6712	1.1300	2997.5185	(278)
Space and water heating			4923.4797	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	168.8430	1.5338	258.9770	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-649.2301	1.4971	-971.9555	
PV Unit electricity exported	-925.0360	0.4620	-427.3692	
Total			-1399.3246	(283)
Total Primary energy kWh/year			3913.2328	(286)
Target Primary Energy Rate (TPER)			61.4300	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF FABRIC ENERGY EFFICIENCY

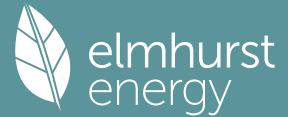
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	6.0000 (1b)	x 2.4000 (2b)	= 14.4000 (1b) - (3b)	
First floor	57.7000 (1c)	x 2.4000 (2c)	= 138.4800 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.7000			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 152.8800	(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)

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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	Air changes per hour	0.1308 (8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50				3.0000 (17)
Infiltration rate				0.2808 (18)
Number of sides sheltered				2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =			0.2387 (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)
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)
	0.3043	0.2984	0.2924	0.2626	0.2566	0.2268	0.2268	0.2208	0.2387	0.2566	0.2685	0.2805	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													0.0000 (23c)
Effective ac	0.5463	0.5445	0.5428	0.5345	0.5329	0.5257	0.5257	0.5244	0.5285	0.5329	0.5361	0.5393	(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								
Ent Door			1.9600	1.1000	2.1560			(26a)
Windows			8.1000	1.0536	8.5345			(27)
Heatloss Floor 1			6.0000	0.1200	0.7200	75.0000	450.0000	(28a)
External Wall 1	66.7200	10.0600	56.6600	0.2000	11.3320	60.0000	3399.6000	(29a)
Planned Roof	57.7000		57.7000	0.0900	5.1930	9.0000	519.3000	(30)
Total net area of external elements Aum(A, m2)			130.4200					(31)
Fabric heat loss, W/K = Sum (A x U)					27.9355			(32)
Main dwelling								
Party Wall 1			36.9600	0.0000	0.0000	70.0000	2587.2000	(32)
Party Floor 1			49.7000			30.0000	1491.0000	(32a)
Internal Wall 1			113.7600			9.0000	1023.8400	(32c)
Internal Floor 1			6.0000			18.0000	108.0000	(32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9578.9400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		150.3758 (35)

List of Thermal Bridges	Length	Psi-value	Total	
K1 Element	7.2000	0.0570	0.4104	
E16 Corner (normal)	6.0000	0.3200	1.9200	
P1 Party wall - Ground floor	6.9300	0.0480	0.3326	
E2 Other lintels (including other steel lintels)	6.0000	0.0450	0.2700	
E3 Sill	15.0000	0.0510	0.7650	
E4 Jamb	6.1000	0.0000	0.0000	
E6 Intermediate floor within a dwelling	21.7000	0.0640	1.3888	
E7 Party floor between dwellings (in blocks of flats)	9.6000	0.0620	0.5952	
E18 Party wall between dwellings	9.4000	0.0000	0.0000	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.4000	0.4800	4.5120	
P4 Party wall - Roof (insulation at ceiling level)	21.7000	0.0840	1.8228	
E10 Eaves (insulation at ceiling level)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				12.0168 (36)
Point Thermal bridges				0.0000 (36a)
Total fabric heat loss				39.9523 (37)

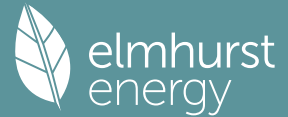
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	27.5616	27.4709	27.3820	26.9643	26.8861	26.5223	26.5223	26.4549	26.6625	26.8861	27.0442	27.2095	(38)
Average = Sum(39)m / 12 =	67.5140	67.4232	67.3343	66.9166	66.8384	66.4746	66.4746	66.4073	66.6148	66.8384	66.9965	67.1618	(39)
												66.9162	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0599	1.0584	1.0571	1.0505	1.0493	1.0436	1.0436	1.0425	1.0458	1.0493	1.0518	1.0543	(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													2.0841 (42)
Hot water usage for mixer showers													
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	(42a)
Hot water usage for baths													
24.9953	24.6180	24.0812	23.2773	22.5529	21.5556	20.7990	21.7242	22.2097	23.1979	24.2253	24.9754		(42b)
Hot water usage for other uses													
35.9731	34.6650	33.3569	32.0488	30.7407	29.4325	29.4325	30.7407	32.0488	33.3569	34.6650	35.9731		(42c)
Average daily hot water use (litres/day)												55.8794	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	60.9684	59.2830	57.4381	55.3261	53.2935	50.9881	50.2315	52.4648	54.2585	56.5548	58.8903	60.9486	(44)
Energy conte	89.7560	78.4433	82.0778	72.2697	68.6741	58.9661	55.5073	61.7521	62.9372	72.8766	79.5922	89.5074	(45)
Energy content (annual)													872.3597
Distribution loss (46)m = 0.15 x (45)m													
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	(46)
Water storage loss:													
Total storage loss													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
76.2926	66.6768	69.7661	61.4293	58.3730	50.1212	47.1812	52.4893	53.4966	61.9451	67.6534	76.0813		(62)

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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	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	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	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	0.0000 (63d)
Output from w/h	76.2926	66.6768	69.7661	61.4293	58.3730	50.1212	47.1812	52.4893	53.4966	61.9451	67.6534	76.0813	(64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =												741.5058 (64)
Electric shower(s)	47.3796	42.2156	46.0978	43.9906	44.8160	42.7502	44.1752	44.8160	43.9906	46.0978	45.2310	47.3796	(64a)
Heat gains from water heating, kWh/month	30.9180	27.2231	28.9660	26.3550	25.7973	23.2178	22.8391	24.3263	24.3718	27.0107	28.2211	30.8652	(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	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	100.6872	111.4751	100.6872	104.0435	100.6872	104.0435	100.6872	100.6872	104.0435	100.6872	104.0435	100.6872	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	182.1728	184.0632	179.2995	169.1581	156.3565	144.3247	136.2868	134.3964	139.1601	149.3014	162.1031	174.1348	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	(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)	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	(71)
Water heating gains (Table 5)	41.5565	40.5106	38.9328	36.6041	34.6737	32.2470	30.6977	32.6967	33.8497	36.3047	39.1960	41.4855	(72)
Total internal gains	378.6778	390.3102	373.1808	364.0670	345.9787	334.8764	321.9330	322.0416	331.3145	340.5547	359.6038	370.5689	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c				Access factor Table 6d	Gains W
North				4.0500	10.6334	0.5100	0.0000				0.7700	16.9117 (74)
South				4.0500	46.7521	0.5100	0.0000				0.7700	74.3561 (78)
Solar gains	91.2678	154.0953	210.0394	263.5333	301.5255	303.0306	290.5542	261.0554	228.0719	169.8188	109.0001	78.3490 (83)
Total gains	469.9456	544.4055	583.2201	627.6003	647.5042	637.9071	612.4871	583.0969	559.3864	510.3734	468.6039	448.9178 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	39.4114	39.4644	39.5165	39.7632	39.8097	40.0275	40.0275	40.0682	39.9433	39.8097	39.7157	39.6180
alpha	3.6274	3.6310	3.6344	3.6509	3.6540	3.6685	3.6685	3.6712	3.6629	3.6540	3.6477	3.6412
util living area	0.9752	0.9576	0.9318	0.8722	0.7688	0.6077	0.4604	0.4995	0.7027	0.8873	0.9577	0.9787 (86)
MIT	19.3155	19.5793	19.9096	20.3381	20.6875	20.9045	20.9735	20.9640	20.8318	20.3884	19.7829	19.2632 (87)
Th 2	20.0337	20.0349	20.0361	20.0415	20.0425	20.0472	20.0472	20.0481	20.0454	20.0425	20.0404	20.0383 (88)
util rest of house	0.9704	0.9496	0.9186	0.8469	0.7230	0.5345	0.3677	0.4056	0.6351	0.8597	0.9483	0.9746 (89)
MIT 2	18.5078	18.7671	19.0897	19.5014	19.8167	19.9938	20.0373	20.0336	19.9423	19.5569	18.9744	18.4596 (90)
Living area fraction	18.7652	19.0259	19.3510	19.7680	20.0942	20.2840	20.3356	20.3301	20.2258	19.8219	19.2320	18.7157 (91)
MIT	18.7652	19.0259	19.3510	19.7680	20.0942	20.2840	20.3356	20.3301	20.2258	19.8219	19.2320	18.7157 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7652	19.0259	19.3510	19.7680	20.0942	20.2840	20.3356	20.3301	20.2258	19.8219	19.2320	18.7157 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9622	0.9392	0.9074	0.8387	0.7257	0.5536	0.3965	0.4344	0.6488	0.8524	0.9384	0.9671	(94)
Ext temp.	452.1756	511.3187	529.2204	526.3853	469.8904	353.1470	242.8616	253.2688	362.9283	435.0206	439.7554	434.1306	(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	976.6035	952.4159	865.3128	727.2497	561.0551	377.8446	248.3234	260.9860	408.0662	616.3781	812.8049	974.9001	(97)
Space heating requirement - total per year (kWh/year)	390.1744	296.4173	250.0528	144.6224	67.8265	0.0000	0.0000	0.0000	0.0000	134.9300	268.5956	402.3325	(98a)
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)	390.1744	296.4173	250.0528	144.6224	67.8265	0.0000	0.0000	0.0000	0.0000	134.9300	268.5956	402.3325	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)	390.1744	296.4173	250.0528	144.6224	67.8265	0.0000	0.0000	0.0000	0.0000	134.9300	268.5956	402.3325	(98c)
Space heating per m2	(98c) / (4) =												30.6900 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	0.0000	0.0000	0.0000	0.0000	0.0000	624.8617	491.9124	504.6953	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8290	0.8897	0.8691	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	517.9849	437.6598	438.6115	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	701.9287	674.5091	642.0617	0.0000	0.0000	0.0000	0.0000	(103)

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Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	132.4395	176.2158	151.3669	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fC = cooled area / (4) =											1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	33.1099	44.0540	37.8417	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												115.0056 (107)
Energy for space heating												30.6900 (99)
Energy for space cooling												1.8054 (108)
Total												32.4954 (109)
Fabric Energy Efficiency (DFEE)												32.5 (109)

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

1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	6.0000 (1b)	x 2.4000 (2b)	= 14.4000 (1b) - (3b)
First floor	57.7000 (1c)	x 2.4000 (2c)	= 138.4800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	152.8800 (5)

2. Ventilation rate

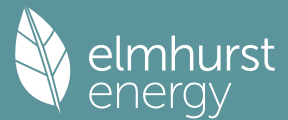
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.1308 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3808 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3237 (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	0.4127	0.4046	0.3965	0.3561	0.3480	0.3075	0.3075	0.2994	0.3237	0.3480	0.3642	0.3803 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5852	0.5819	0.5786	0.5634	0.5605	0.5473	0.5473	0.5448	0.5524	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 Semi-glazed door			1.9600	1.0000	1.9600		(26a)
TER Opening Type			8.1000	1.1450	9.2748		(27)
Heatloss Floor 1			6.0000	0.1300	0.7800		(28a)
External Wall 1	66.7200	10.0600	56.6600	0.1800	10.1988		(29a)
Planned Roof	57.7000		57.7000	0.1100	6.3470		(30)
Total net area of external elements Aum(A, m2)			130.4200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.5606		(33)
Main dwelling							
Party Wall 1			36.9600	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							150.3758 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E16 Corner (normal)				7.2000	0.0900	0.6480	
P1 Party wall - Ground floor				6.0000	0.0800	0.4800	
E2 Other lintels (including other steel lintels)				6.9300	0.0500	0.3465	
E3 Sill				6.0000	0.0500	0.3000	
E4 Jamb				15.0000	0.0500	0.7500	
E6 Intermediate floor within a dwelling				6.1000	0.0000	0.0000	
E7 Party floor between dwellings (in blocks of flats)				21.7000	0.0700	1.5190	
E18 Party wall between dwellings				9.6000	0.0600	0.5760	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				9.4000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)				9.4000	0.1200	1.1280	
E10 Eaves (insulation at ceiling level)				21.7000	0.0600	1.3020	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.0495 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	35.6101 (37)

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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	29.5219	29.3551	29.1915	28.4234	28.2796	27.6106	27.6106	27.4867	27.8683	28.2796	28.5704	28.8743 (38)
Average = Sum(39)m / 12 =	65.1320	64.9652	64.8016	64.0335	63.8898	63.2207	63.2207	63.0968	63.4784	63.8898	64.1805	64.4845 (39)
												64.0328
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0225	1.0199	1.0173	1.0052	1.0030	0.9925	0.9925	0.9905	0.9965	1.0030	1.0075	1.0123 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

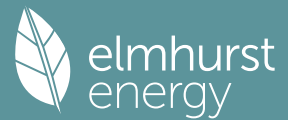
4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.0841 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths												25.5652 (42b)
Hot water usage for other uses												35.9731 (42c)
Average daily hot water use (litres/day)												56.4058 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	61.5383	59.8505	58.0077	55.7138	53.6675	51.5409	51.0987	52.9378	54.8240	57.0079	59.3222	61.4519 (44)
Energy conte	97.4616	85.2263	89.1557	76.2694	72.2468	63.3755	61.7995	65.5480	67.6034	77.3592	84.5153	96.2188 (45)
Energy content (annual)										Total = Sum(45)m =		936.7796
Distribution loss (46)m = 0.15 x (45)m												0.0000 (46)
Water storage loss:												
Total storage loss												
If cylinder contains dedicated solar storage												0.0000 (56)
Primary loss												0.0000 (57)
Combi loss												0.0000 (59)
Total heat required for water heating calculated for each month												0.0000 (61)
WWHRS	82.8424	72.4424	75.7824	64.8290	61.4097	53.8692	52.5296	55.7158	57.4629	65.7553	71.8380	81.7860 (62)
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 (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	82.8424	72.4424	75.7824	64.8290	61.4097	53.8692	52.5296	55.7158	57.4629	65.7553	71.8380	81.7860 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		796.2626 (64)
Electric shower(s)	47.3796	42.2156	46.0978	43.9906	44.8160	42.7502	44.1752	44.8160	43.9906	46.0978	45.2310	47.3796 (64a)
Heat gains from water heating, kWh/month	32.5555	28.6645	30.4700	27.2049	26.5564	24.1548	24.1762	25.1330	25.3634	27.9633	29.2673	32.2914 (65)
												538.9400 (64a)

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	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042	104.2042 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	100.6872	111.4751	100.6872	104.0435	100.6872	104.0435	100.6872	100.6872	104.0435	100.6872	104.0435	100.6872 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	182.1728	184.0632	179.2995	169.1581	156.3565	144.3247	136.2868	134.3964	139.1601	149.3014	162.1031	174.1348 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204	33.4204 (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)	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634 (71)
Water heating gains (Table 5)	43.7574	42.6555	40.9544	37.7846	35.6942	33.5484	32.4949	33.7809	35.2269	37.5851	40.6490	43.4024 (72)
Total internal gains	380.8787	392.4551	375.2023	365.2474	346.9991	336.1778	323.7301	323.1257	332.6917	341.8350	361.0568	372.4857 (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						
North			4.0500	10.6334	0.6300	0.7000			0.7700			13.1613 (74)
South			4.0500	46.7521	0.6300	0.7000			0.7700			57.8666 (78)
Solar gains	71.0279	119.9224	163.4601	205.0909	234.6578	235.8291	226.1195	203.1625	177.4936	132.1590	84.8278	60.9739 (83)
Total gains	451.9065	512.3775	538.6624	570.3383	581.6569	572.0070	549.8496	526.2883	510.1853	473.9940	445.8846	433.4597 (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	40.8527	40.9576	41.0610	41.5535	41.6470	42.0877	42.0877	42.1704	41.9169	41.6470	41.4583	41.2629
alpha	3.7235	3.7305	3.7374	3.7702	3.7765	3.8058	3.8058	3.8114	3.7945	3.7765	3.7639	3.7509
util living area	0.9774	0.9631	0.9425	0.8918	0.7990	0.6390	0.4865	0.5243	0.7273	0.9000	0.9618	0.9804 (86)
MIT	19.3572	19.5941	19.9001	20.3198	20.6690	20.8997	20.9726	20.9633	20.8285	20.3919	19.8171	19.3211 (87)
Th 2	20.0646	20.0668	20.0689	20.0790	20.0809	20.0896	20.0896	20.0912	20.0862	20.0809	20.0771	20.0731 (88)
util rest of house												

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MIT 2	0.9731	0.9561	0.9312	0.8696	0.7567	0.5676	0.3937	0.4313	0.6627	0.8752	0.9534	0.9766 (89)
Living area fraction	18.5718	18.8061	19.1071	19.5172	19.8372	20.0321	20.0790	20.0760	19.9789	19.5928	19.0358	18.5424 (90)
MIT	18.8221	19.0572	19.3598	19.7730	20.1023	20.3086	20.3638	20.3588	20.2496	19.8474	19.2848	18.7905 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8221	19.0572	19.3598	19.7730	20.1023	20.3086	20.3638	20.3588	20.2496	19.8474	19.2848	18.7905 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9656	0.9467	0.9207	0.8611	0.7578	0.5856	0.4224	0.4596	0.6751	0.8678	0.9443	0.9698	(94)
Useful gains	436.3482	485.0705	495.9703	491.1321	440.7917	334.9873	232.2775	241.9046	344.4422	411.3293	421.0475	420.3560	(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	945.8527	919.7248	833.3359	696.2336	536.8214	360.9030	237.9485	249.7877	390.3692	590.8158	782.0252	940.8629	(97)
Space heating kWh	379.0714	292.0877	251.0000	147.6731	71.4462	0.0000	0.0000	0.0000	0.0000	133.5380	259.9039	387.2571	(98a)
Space heating requirement - total per year (kWh/year)												1921.9774	
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	379.0714	292.0877	251.0000	147.6731	71.4462	0.0000	0.0000	0.0000	0.0000	133.5380	259.9039	387.2571	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1921.9774	
Space heating per m2												30.1723	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	0.0000	0.0000	0.0000	0.0000	0.0000	594.2747	467.8333	479.5358	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8112	0.8780	0.8576	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	482.0778	410.7448	411.2448	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	624.6829	600.9930	575.4789	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	102.6757	141.5447	122.1902	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fc = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	25.6689	35.3862	30.5475	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												91.6026	(107)
Energy for space heating												30.1723	(99)
Energy for space cooling												1.4380	(108)
Total												31.6104	(109)
Fabric Energy Efficiency (TFEE)												31.6	(109)

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

CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

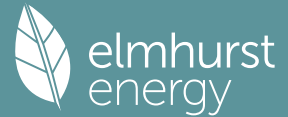
	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	6.0000 (1b)	x 2.4000 (2b)	= 14.4000 (1b) - (3b)	
First floor	57.7000 (1c)	x 2.4000 (2c)	= 138.4800 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.7000		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 152.8800 (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) = 0.1308 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.2808 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2387 (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)

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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												
Effective ac	0.3043	0.2984	0.2924	0.2626	0.2566	0.2268	0.2268	0.2208	0.2387	0.2566	0.2685	0.2805 (22b)
	0.5463	0.5445	0.5428	0.5345	0.5329	0.5257	0.5257	0.5244	0.5285	0.5329	0.5361	0.5393 (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							
Ent Door			1.9600	1.1000	2.1560		(26a)
Windows			8.1000	1.0536	8.5345		(27)
Heatloss Floor 1			6.0000	0.1200	0.7200	75.0000	450.0000 (28a)
External Wall 1	66.7200	10.0600	56.6600	0.2000	11.3320	60.0000	3399.6000 (29a)
Planned Roof	57.7000		57.7000	0.0900	5.1930	9.0000	519.3000 (30)
Total net area of external elements Aum(A, m2)			130.4200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.9355		(33)
Main dwelling							
Party Wall 1			36.9600	0.0000	0.0000	70.0000	2587.2000 (32)
Party Floor 1			49.7000			30.0000	1491.0000 (32d)
Internal Wall 1			113.7600			9.0000	1023.8400 (32c)
Internal Floor 1			6.0000			18.0000	108.0000 (32d)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9578.9400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							150.3758 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	7.2000	0.0570	0.4104
P1 Party wall - Ground floor	6.0000	0.3200	1.9200
E2 Other lintels (including other steel lintels)	6.9300	0.0480	0.3326
E3 Sill	6.0000	0.0450	0.2700
E4 Jamb	15.0000	0.0510	0.7650
E6 Intermediate floor within a dwelling	6.1000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	21.7000	0.0640	1.3888
E18 Party wall between dwellings	9.6000	0.0620	0.5952
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.4000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	9.4000	0.4800	4.5120
E10 Eaves (insulation at ceiling level)	21.7000	0.0840	1.8228

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

Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	39.9523 (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	27.5616	27.4709	27.3820	26.9643	26.8861	26.5223	26.5223	26.4549	26.6625	26.8861	27.0442	27.2095 (38)
Heat transfer coeff	67.5140	67.4232	67.3343	66.9166	66.8384	66.4746	66.4746	66.4073	66.6148	66.8384	66.9965	67.1618 (39)
Average = Sum(39)m / 12 =												66.9162

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0599	1.0584	1.0571	1.0505	1.0493	1.0436	1.0436	1.0425	1.0458	1.0493	1.0518	1.0543 (40)
HLP (average)												1.0505
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

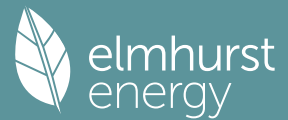
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0841 (42)
Hot water usage for mixer showers	57.6681	56.7852	55.4841	53.4825	51.6891	49.1801	47.1957	49.5156	50.6824	53.1674	55.7553	57.6161 (42a)
Hot water usage for baths	24.9953	24.6180	24.0812	23.2773	22.5529	21.5556	20.7990	21.7242	22.2097	23.1979	24.2253	24.9754 (42b)
Hot water usage for other uses	35.9731	34.6650	33.3569	32.0488	30.7407	29.4325	29.4325	30.7407	32.0488	33.3569	34.6650	35.9731 (42c)
Average daily hot water use (litres/day)												109.0449 (43)
Daily hot water use	118.6365	116.0682	112.9221	108.8086	104.9826	100.1683	97.4272	101.9804	104.9409	109.7222	114.6456	118.5647 (44)
Energy conte	174.6534	153.5817	161.3634	142.1312	135.2807	115.8412	107.6600	120.0329	121.7262	141.3882	154.9474	174.1209 (45)
Energy content (annual)										Total = Sum(45)m =		1702.7271
Distribution loss (46)m = 0.15 x (45)m	26.1980	23.0373	24.2045	21.3197	20.2921	17.3762	16.1490	18.0049	18.2589	21.2082	23.2421	26.1181 (46)
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.9700 (48)
Temperature factor from Table 2b												0.6000 (49)
Enter (49) or (54) in (55)												0.5820 (55)
Total storage loss	18.0420	16.2960	18.0420	17.4600	18.0420	17.4600	18.0420	18.0420	17.4600	18.0420	17.4600	18.0420 (56)
If cylinder contains dedicated solar storage	18.0420	16.2960	18.0420	17.4600	18.0420	17.4600	18.0420	18.0420	17.4600	18.0420	17.4600	18.0420 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	192.6954	169.8777	179.4054	159.5912	153.3227	133.3012	125.7020	138.0749	139.1862	159.4302	172.4074	192.1629 (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	-13.0777	-27.7222	-55.7491	-84.8059	-113.1361	-114.1607	-112.6728	-94.6447	-68.5683	-39.8030	-17.4913	-10.3162 (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	179.6177	142.1554	123.6564	74.7852	40.1867	19.1406	13.0291	43.4302	70.6179	119.6272	154.9161	181.8467 (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	58.0723	51.0659	53.6533	47.2586	44.9808	38.5172	35.7969	39.9109	40.4740	47.0116	51.5200	57.8952 (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	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.1347	24.9890	20.3224	15.3854	11.5007	9.7094	10.4914	13.6371	18.3036	23.2407	27.1253	28.9166 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	271.8997	274.7212	267.6112	252.4748	233.3678	215.4100	203.4131	200.5916	207.7016	222.8380	241.9449	259.9028 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886 (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)	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634 (71)
Water heating gains (Table 5)	78.0541	75.9909	72.1147	65.6370	60.4581	53.4961	48.1142	53.6437	56.2138	63.1876	71.5555	77.8161 (72)
Total internal gains	469.3588	466.9713	451.3185	424.7674	396.5970	369.8858	353.2889	359.1427	373.4894	400.5365	431.8960	457.9058 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
North					4.0500	10.6334	0.5100	0.0000			0.7700			16.9117 (74)
South					4.0500	46.7521	0.5100	0.0000			0.7700			74.3561 (78)
Solar gains	91.2678	154.0953	210.0394	263.5333	301.5255	303.0306	290.5542	261.0554	228.0719	169.8188	109.0001	78.3490 (83)		
Total gains	560.6266	621.0667	661.3579	688.3007	698.1225	672.9165	643.8431	620.1981	601.5612	570.3553	540.8962	536.2548 (84)		

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	39.4114	39.4644	39.5165	39.7632	39.8097	40.0275	40.0275	40.0682	39.9433	39.8097	39.7157	39.6180
alpha	3.6274	3.6310	3.6344	3.6509	3.6540	3.6685	3.6685	3.6712	3.6629	3.6540	3.6477	3.6412
util living area	0.9585	0.9391	0.9063	0.8437	0.7374	0.5832	0.4402	0.4733	0.6700	0.8552	0.9372	0.9639 (86)
MIT	19.5146	19.7352	20.0504	20.4222	20.7304	20.9166	20.9771	20.9698	20.8569	20.4766	19.9296	19.4586 (87)
Th 2	20.0337	20.0349	20.0361	20.0415	20.0425	20.0472	20.0472	20.0481	20.0454	20.0425	20.0404	20.0383 (88)
util rest of house	0.9510	0.9283	0.8895	0.8152	0.6897	0.5110	0.3507	0.3830	0.6016	0.8230	0.9243	0.9573 (89)
MIT 2	18.3247	18.6006	18.9914	19.4441	19.7959	19.9880	20.0363	20.0327	19.9347	19.5186	18.8523	18.2579 (90)
Living area fraction									fLA = Living area / (4) =			0.3187 (91)
MIT	18.7039	18.9622	19.3289	19.7558	20.0937	20.2840	20.3361	20.3313	20.2286	19.8239	19.1956	18.6405 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7039	18.9622	19.3289	19.7558	20.0937	20.2840	20.3361	20.3313	20.2286	19.8239	19.1956	18.6405 (93)

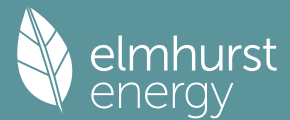
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9377	0.9136	0.8749	0.8056	0.6924	0.5297	0.3785	0.4106	0.6156	0.8146	0.9102	0.9448 (94)
Ext temp.	525.6964	567.3882	578.6442	554.5155	483.4040	356.4526	243.6695	254.6468	370.3172	464.5963	492.3091	506.6451 (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	972.4654	948.1157	863.8232	726.4358	561.0239	377.8394	248.3562	261.0680	408.2564	616.5102	810.3634	969.8536 (97)
Space heating requirement - total per year (kWh/year)	332.3962	255.8488	212.1732	123.7827	57.7492	0.0000	0.0000	0.0000	0.0000	113.0239	228.9991	344.6271 (98a)
Solar heating kWh												1668.6002
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	332.3962	255.8488	212.1732	123.7827	57.7492	0.0000	0.0000	0.0000	0.0000	113.0239	228.9991	344.6271 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1668.6002
Space heating per m2										(98c) / (4) =		26.1947 (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 %)												100.0000 (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)	332.3962	255.8488	212.1732	123.7827	57.7492	0.0000	0.0000	0.0000	0.0000	113.0239	228.9991	344.6271 (98)
Space heating fuel (main heating system)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating efficiency (main heating system 2)	332.3962	255.8488	212.1732	123.7827	57.7492	0.0000	0.0000	0.0000	0.0000	113.0239	228.9991	344.6271 (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	179.6177	142.1554	123.6564	74.7852	40.1867	19.1406	13.0291	43.4302	70.6179	119.6272	154.9161	181.8467 (64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month	179.6177	142.1554	123.6564	74.7852	40.1867	19.1406	13.0291	43.4302	70.6179	119.6272	154.9161	181.8467 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	24.6261	19.7560	17.7881	13.0323	10.0665	8.2244	9.1830	11.9364	15.5043	20.3424	22.9767	25.3105	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-37.3661	-54.9159	-80.5032	-88.5835	-88.6842	-72.0672	-71.0850	-67.5327	-60.7898	-59.4774	-41.2177	-32.1069	(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	1.8104	2.1384	0.1003	-7.9597	-21.2918	-32.8014	-32.3745	-27.0805	-19.4863	-3.1429	1.2426	1.6556	(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												1668.6002	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												100.0000	
Water heating fuel used												1163.0091	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												198.7468	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-891.5194	(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												2138.8367	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1 (high-rate cost)	1668.6002	19.6000	327.0456 (240)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (electric off-peak tariff)			
High-rate fraction			0.0405 (243)
Low-rate fraction			0.9595 (244)
High-rate cost	47.0804	19.6000	9.2278 (245)
Low-rate cost	1115.9288	9.4000	104.8973 (246)
Energy for instantaneous electric shower(s)	0.0000	18.5800	0.0000 (247a)
Pumps, fans and electric keep-hot (0.90*19.60 + 0.10*9.40)	0.0000	0.0000	0.0000 (249)
Energy for lighting (0.90*19.60 + 0.10*9.40)	198.7468	18.5800	36.9272 (250)
Additional standing charges			7.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-754.3296	18.5800	-140.1544
PV Unit electricity exported	-137.1898	5.5900	-7.6689
Total			-147.8234 (252)
Total energy cost			337.2745 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.1170 (257)
SAP value		81.8933
SAP rating (Section 12)		82 (258)
SAP band		B

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 (high-rate cost)	1668.6002	0.1629	271.7945 (261)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating - high rate cost	47.0804	0.1565	7.3688 (264)
Water heating - low rate cost	1115.9288	0.1314	146.6094 (264)
Space and water heating			425.7728 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	198.7468	0.1490	29.6172 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-754.3296	0.1405	-105.9541
PV Unit electricity exported	-137.1898	0.1035	-14.2007
Total			-120.1548 (269)
Total CO2, kg/year			335.2352 (272)
CO2 emissions per m2			5.2600 (273)
EI value			95.8674
EI rating			96 (274)
EI band			A

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CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

Main dwelling	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	6.0000 (1b)	x 2.4000 (2b)	= 14.4000 (1b) - (3b)
First floor	57.7000 (1c)	x 2.4000 (2c)	= 138.4800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 152.8800 (5)

2. Ventilation rate

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) =	0.1308 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.2808	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2387 (21)
Wind speed	Jan 3.8000 Feb 3.5000 Mar 3.7000 Apr 3.4000 May 3.5000 Jun 3.0000 Jul 3.1000 Aug 3.0000 Sep 3.0000 Oct 3.2000 Nov 3.1000 Dec 3.5000	(22)
Wind factor	0.9500 0.8750 0.9250 0.8500 0.8750 0.7500 0.7750 0.7500 0.7500 0.8000 0.7750 0.8750	(22a)
Adj infilt rate	0.2268 0.2089 0.2208 0.2029 0.2089 0.1790 0.1850 0.1790 0.1790 0.1910 0.1850 0.2089	(22b)
Effective ac	0.5257 0.5218 0.5244 0.5206 0.5218 0.5160 0.5171 0.5160 0.5160 0.5182 0.5171 0.5218	(25)

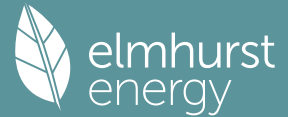
3. Heat losses and heat loss parameter

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							
Ent Door			1.9600	1.1000	2.1560		(26a)
Windows			8.1000	1.0536	8.5345		(27)
Heatloss Floor 1			6.0000	0.1200	0.7200	75.0000	450.0000 (28a)
External Wall 1	66.7200	10.0600	56.6600	0.2000	11.3320	60.0000	3399.6000 (29a)
Planned Roof	57.7000		57.7000	0.0900	5.1930	9.0000	519.3000 (30)
Total net area of external elements Aum(A, m ²)			130.4200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	27.9355			(33)
Main dwelling							
Party Wall 1			36.9600	0.0000	0.0000	70.0000	2587.2000 (32)
Party Floor 1			49.7000			30.0000	1491.0000 (32d)
Internal Wall 1			113.7600			9.0000	1023.8400 (32c)
Internal Floor 1			6.0000			18.0000	108.0000 (32d)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =				9578.9400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							150.3758 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E16 Corner (normal)				7.2000	0.0570	0.4104	
P1 Party wall - Ground floor				6.0000	0.3200	1.9200	
E2 Other lintels (including other steel lintels)				6.9300	0.0480	0.3326	
E3 Sill				6.0000	0.0450	0.2700	
E4 Jamb				15.0000	0.0510	0.7650	
E6 Intermediate floor within a dwelling				6.1000	0.0000	0.0000	
E7 Party floor between dwellings (in blocks of flats)				21.7000	0.0640	1.3888	
E18 Party wall between dwellings				9.6000	0.0620	0.5952	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				9.4000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)				9.4000	0.4800	4.5120	
E10 Eaves (insulation at ceiling level)				21.7000	0.0840	1.8228	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.0168 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	39.9523 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	Jan 26.5223 Feb 26.3256 Mar 26.4549 Apr 26.2636 May 26.3256 Jun 26.0337 Jul 26.0885 Aug 26.0337 Sep 26.0337 Oct 26.1450 Nov 26.0885 Dec 26.3256						(38)
Heat transfer coeff	66.4746 66.2779 66.4073 66.2159 66.2779 65.9860 66.0408 65.9860 65.9860 66.0974 66.0408 66.2779						(39)
Average = Sum(39)m / 12 =							66.1724
HLP	Jan 1.0436 Feb 1.0405 Mar 1.0425 Apr 1.0395 May 1.0405 Jun 1.0359 Jul 1.0367 Aug 1.0359 Sep 1.0359 Oct 1.0376 Nov 1.0367 Dec 1.0405						(40)
HLP (average)							1.0388
Days in mont	31 28 31 30 31 30 31 31 30 31 30 31						

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.0841 (42)
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Hot water usage for mixer showers	57.6681	56.7852	55.4841	53.4825	51.6891	49.1801	47.1957	49.5156	50.6824	53.1674	55.7553	57.6161 (42a)
Hot water usage for baths	24.9953	24.6180	24.0812	23.2773	22.5529	21.5556	20.7990	21.7242	22.2097	23.1979	24.2253	24.9754 (42b)
Hot water usage for other uses	35.9731	34.6650	33.3569	32.0488	30.7407	29.4325	29.4325	30.7407	32.0488	33.3569	34.6650	35.9731 (42c)
Average daily hot water use (litres/day)												109.0449 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	118.6365	116.0682	112.9221	108.8086	104.9826	100.1683	97.4272	101.9804	104.9409	109.7222	114.6456	118.5647	(44)
Energy conte	174.6534	153.5817	161.3634	142.1312	135.2807	115.8412	107.6600	120.0329	121.7262	141.3882	154.9474	174.1209	(45)
Energy content (annual)	Total = Sum(45)m =												1702.7271
Distribution loss (46)m = 0.15 x (45)m	26.1980	23.0373	24.2045	21.3197	20.2921	17.3762	16.1490	18.0049	18.2589	21.2082	23.2421	26.1181	(46)
Water storage loss:													
Store volume													201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													0.9700 (48)
Temperature factor from Table 2b													0.6000 (49)
Enter (49) or (54) in (55)													0.5820 (55)
Total storage loss	18.0420	16.2960	18.0420	17.4600	18.0420	17.4600	18.0420	18.0420	17.4600	18.0420	17.4600	18.0420	(56)
If cylinder contains dedicated solar storage	18.0420	16.2960	18.0420	17.4600	18.0420	17.4600	18.0420	18.0420	17.4600	18.0420	17.4600	18.0420	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	192.6954	169.8777	179.4054	159.5912	153.3227	133.3012	125.7020	138.0749	139.1862	159.4302	172.4074	192.1629	(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	-16.7609	-29.4150	-58.5935	-90.9449	-116.6033	-126.4569	-123.9353	-107.4769	-77.5103	-46.4217	-21.9021	-13.3411	(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	175.9345	140.4626	120.8120	68.6463	36.7194	6.8444	1.7667	30.5980	61.6760	113.0084	150.5053	178.8219	(64)
	Total per year (kWh/year) = Sum(64)m =												1085.7954 (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	58.0723	51.0659	53.6533	47.2586	44.9808	38.5172	35.7969	39.9109	40.4740	47.0116	51.5200	57.8952	(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	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.1347	24.9890	20.3224	15.3854	11.5007	9.7094	10.4914	13.6371	18.3036	23.2407	27.1253	28.9166 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	271.8997	274.7212	267.6112	252.4748	233.3678	215.4100	203.4131	200.5916	207.7016	222.8380	241.9449	259.9028 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886 (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)	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634 (71)
Water heating gains (Table 5)	78.0541	75.9909	72.1147	65.6370	60.4581	53.4961	48.1142	53.6437	56.2138	63.1876	71.5555	77.8161 (72)
Total internal gains	469.3588	466.9713	451.3185	424.7674	396.5970	369.8858	353.2889	359.1427	373.4894	400.5365	431.8960	457.9058 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
North					4.0500	12.7650	0.5100	0.0000			0.7700			20.3020 (74)
South					4.0500	54.2217	0.5100	0.0000			0.7700			86.2361 (78)
Solar gains	106.5381	157.2805	213.7331	274.6425	306.9440	327.4679	311.9001	285.5992	246.2680	186.2338	125.3438			91.9963 (83)
Total gains	575.8968	624.2518	665.0516	699.4099	703.5410	697.3538	665.1890	644.7419	619.7574	586.7703	557.2399	549.9021	(84)	

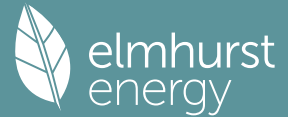
7. Mean internal temperature (heating season)

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	40.0275	40.1464	40.0682	40.1839	40.1464	40.3240	40.2905	40.3240	40.3240	40.2560	40.2905	40.1464
alpha	3.6685	3.6764	3.6712	3.6789	3.6764	3.6883	3.6860	3.6883	3.6883	3.6837	3.6860	3.6764
util living area	0.9488	0.9304	0.8873	0.8087	0.6809	0.4811	0.3334	0.3530	0.6036	0.8161	0.9210	0.9556 (86)
MIT	19.6923	19.8701	20.2083	20.5545	20.8202	20.9639	20.9931	20.9914	20.9112	20.6058	20.0918	19.6296 (87)
Th 2	20.0472	20.0497	20.0481	20.0505	20.0497	20.0535	20.0528	20.0535	20.0535	20.0521	20.0528	20.0497 (88)
util rest of house	0.9394	0.9180	0.8669	0.7743	0.6252	0.4026	0.2425	0.2600	0.5284	0.7763	0.9047	0.9474 (89)
MIT 2	18.5572	18.7792	19.1933	19.6050	19.8963	20.0324	20.0506	20.0507	19.9912	19.6739	19.0612	18.4810 (90)
Living area fraction	18.9190	19.1269	19.5168	19.9076	20.1907	20.3292	20.3510	20.3505	20.2844	19.9709	19.3897	18.8470 (91)
MIT	18.9190	19.1269	19.5168	19.9076	20.1907	20.3292	20.3510	20.3505	20.2844	19.9709	19.3897	18.8470 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9190	19.1269	19.5168	19.9076	20.1907	20.3292	20.3510	20.3505	20.2844	19.9709	19.3897	18.8470 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9255	0.9034	0.8537	0.7686	0.6340	0.4261	0.2715	0.2895	0.5476	0.7725	0.8909	0.9342 (94)
Useful gains	533.0203	563.9471	567.7877	537.5921	446.0261	297.1157	180.5696	186.6694	339.3822	453.2604	496.4684	513.7064 (95)

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Ext temp.	5.0000	5.5000	7.4000	9.8000	12.7000	15.7000	17.6000	17.5000	14.8000	11.4000	7.8000	4.9000 (96)
Heat loss rate W	925.2580	903.1602	804.6411	669.2836	496.4699	305.4642	181.6766	188.0905	361.8912	566.5120	765.3903	924.3812 (97)
Space heating kWh	291.8249	227.9512	176.2189	94.8178	37.5302	0.0000	0.0000	0.0000	0.0000	84.2592	193.6237	305.5421 (98a)
Space heating requirement - total per year (kWh/year)												1411.7680
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	291.8249	227.9512	176.2189	94.8178	37.5302	0.0000	0.0000	0.0000	0.0000	84.2592	193.6237	305.5421 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1411.7680
Space heating per m2										(98c) / (4) =		22.1628 (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 %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	291.8249	227.9512	176.2189	94.8178	37.5302	0.0000	0.0000	0.0000	0.0000	84.2592	193.6237	305.5421 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	291.8249	227.9512	176.2189	94.8178	37.5302	0.0000	0.0000	0.0000	0.0000	84.2592	193.6237	305.5421 (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	175.9345	140.4626	120.8120	68.6463	36.7194	6.8444	1.7667	30.5980	61.6760	113.0084	150.5053	178.8219 (64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month	175.9345	140.4626	120.8120	68.6463	36.7194	6.8444	1.7667	30.5980	61.6760	113.0084	150.5053	178.8219 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	24.6261	19.7560	17.7881	13.0323	10.0665	8.2244	9.1830	11.9364	15.5043	20.3424	22.9767	25.3105 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-42.8691	-56.0577	-80.5854	-88.1456	-86.0290	-74.2472	-73.0894	-70.3702	-63.6818	-62.4247	-46.1830	-37.1588 (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	1.6928	1.4602	-2.0633	-12.0974	-25.7207	-36.4275	-35.6955	-30.8418	-22.0779	-5.8073	0.6244	1.6650 (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												1411.7680 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												100.0000
Water heating fuel used												1085.7954 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												198.7468 (232)

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

PV generation			-946.1310 (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			1750.1792 (238)

10a. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1 (high-rate cost)	1411.7680	34.6000	488.4717 (240)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (electric off-peak tariff)			
High-rate fraction			0.0405 (243)
Low-rate fraction			0.9595 (244)
High-rate cost	43.9546	34.6000	15.2083 (245)
Low-rate cost	1041.8407	15.8000	164.6108 (246)
Energy for instantaneous electric shower(s)	0.0000	32.7200	0.0000 (247a)
Pumps, fans and electric keep-hot (0.90*34.60 + 0.10*15.80)	0.0000	0.0000	0.0000 (249)
Energy for lighting (0.90*34.60 + 0.10*15.80)	198.7468	32.7200	65.0299 (250)
Additional standing charges			8.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-780.8419	32.7200	-255.4915
PV Unit electricity exported	-165.2891	5.8100	-9.6033
Total			-265.0948 (252)

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Total energy cost

476.2261 (255)

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 (high-rate cost)	1411.7680	0.1635	230.8603 (261)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating - high rate cost	43.9546	0.1580	6.9460 (264)
Water heating - low rate cost	1041.8407	0.1327	138.2006 (264)
Space and water heating			376.0068 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	198.7468	0.1490	29.6172 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-780.8419	0.1407	-109.8856
PV Unit electricity exported	-165.2891	0.1073	-17.7308
Total			-127.6164 (269)
Total CO2, kg/year			278.0077 (272)

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 (high-rate cost)	1411.7680	1.6096	2272.3745 (275)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating - high rate cost	43.9546	1.5896	69.8689 (278)
Water heating - low rate cost	1041.8407	1.4784	1540.2635 (278)
Space and water heating			3882.5069 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	198.7468	1.5547	309.0005 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-780.8419	1.5245	-1190.3877
PV Unit electricity exported	-165.2891	0.3927	-64.9054
Total			-1255.2931 (283)
Total Primary energy kWh/year			2936.2143 (286)

SAP 10 EPC IMPROVEMENTS

1st Flr Flat elec

Current energy efficiency rating: B 82
Current environmental impact rating: A 96

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures: (none)	SAP change	Cost change	CO2 change
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Recommended measures (none)	Typical annual savings	Energy efficiency	Environmental impact
	Total Savings	£0	0.00 kg/m²

Potential energy efficiency rating: B 82
Potential environmental impact rating: A 96

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, South East England):

	Current	Potential	Saving
Electricity	£741	£741	£0
Space heating	£496	£496	£0
Water heating	£180	£180	£0
Lighting	£65	£65	£0
Generated (PV)	-£265	-£265	£0
Total cost of fuels	£476	£476	£0
Total cost of uses	£476	£476	£0
Delivered energy	27 kWh/m²	27 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m²	4 kg/m²	4 kg/m²	0 kg/m²
Primary energy	46 kWh/m²	46 kWh/m²	0 kWh/m²

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1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	6.0000 (1b)	x 2.4000 (2b)	= 14.4000 (1b) - (3b)
First floor	57.7000 (1c)	x 2.4000 (2c)	= 138.4800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	152.8800 (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	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) = 0.1308 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2808 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2387 (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	0.3043	0.2984	0.2924	0.2626	0.2566	0.2268	0.2268	0.2208	0.2387	0.2566	0.2685	0.2805 (22b)
Effective ac	0.5463	0.5445	0.5428	0.5345	0.5329	0.5257	0.5257	0.5244	0.5285	0.5329	0.5361	0.5393 (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							
Ent Door			1.9600	1.1000	2.1560		(26a)
Windows			8.1000	1.0536	8.5345		(27)
Heatloss Floor 1			6.0000	0.1200	0.7200	75.0000	450.0000 (28a)
External Wall 1	66.7200	10.0600	56.6600	0.2000	11.3320	60.0000	3399.6000 (29a)
Planned Roof	57.7000		57.7000	0.0900	5.1930	9.0000	519.3000 (30)
Total net area of external elements Aum(A, m ²)			130.4200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.9355		(33)
Main dwelling							
Party Wall 1			36.9600	0.0000	0.0000	70.0000	2587.2000 (32)
Party Floor 1			49.7000			30.0000	1491.0000 (32d)
Internal Wall 1			113.7600			9.0000	1023.8400 (32c)
Internal Floor 1			6.0000			18.0000	108.0000 (32d)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9578.9400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							150.3758 (35)

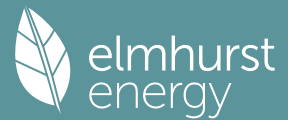
List of Thermal Bridges	Length	Psi-value	Total
K1 Element			
E16 Corner (normal)	7.2000	0.0570	0.4104
P1 Party wall - Ground floor	6.0000	0.3200	1.9200
E2 Other lintels (including other steel lintels)	6.9300	0.0480	0.3326
E3 Sill	6.0000	0.0450	0.2700
E4 Jamb	15.0000	0.0510	0.7650
E6 Intermediate floor within a dwelling	6.1000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	21.7000	0.0640	1.3888
E18 Party wall between dwellings	9.6000	0.0620	0.5952
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.4000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	9.4000	0.4800	4.5120
E10 Eaves (insulation at ceiling level)	21.7000	0.0840	1.8228
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			12.0168 (36)
Point Thermal Bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 39.9523 (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	27.5616	27.4709	27.3820	26.9643	26.8861	26.5223	26.5223	26.4549	26.6625	26.8861	27.0442	27.2095 (38)
Average = Sum(39)m / 12 =	67.5140	67.4232	67.3343	66.9166	66.8384	66.4746	66.4746	66.4073	66.6148	66.8384	66.9965	67.1618 (39)
												66.9162
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0599	1.0584	1.0571	1.0505	1.0493	1.0436	1.0436	1.0425	1.0458	1.0493	1.0518	1.0543 (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												2.0841 (42)
Hot water usage for mixer showers												
Hot water usage for baths	57.6681	56.7852	55.4841	53.4825	51.6891	49.1801	47.1957	49.5156	50.6824	53.1674	55.7553	57.6161 (42a)
Hot water usage for other uses	24.9953	24.6180	24.0812	23.2773	22.5529	21.5556	20.7990	21.7242	22.2097	23.1979	24.2253	24.9754 (42b)
Hot water usage for other uses	35.9731	34.6650	33.3569	32.0488	30.7407	29.4325	29.4325	30.7407	32.0488	33.3569	34.6650	35.9731 (42c)

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Average daily hot water use (litres/day)												109.0449 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	118.6365	116.0682	112.9221	108.8086	104.9826	100.1683	97.4272	101.9804	104.9409	109.7222	114.6456	118.5647 (44)
Energy content (annual)	174.6534	153.5817	161.3634	142.1312	135.2807	115.8412	107.6600	120.0329	121.7262	141.3882	154.9474	174.1209 (45)
Distribution loss (46)m = 0.15 x (45)m	26.1980	23.0373	24.2045	21.3197	20.2921	17.3762	16.1490	18.0049	18.2589	21.2082	23.2421	26.1181 (46)
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.9700 (48)
Temperature factor from Table 2b												0.6000 (49)
Enter (49) or (54) in (55)												0.5820 (55)
Total storage loss	18.0420	16.2960	18.0420	17.4600	18.0420	17.4600	18.0420	18.0420	17.4600	18.0420	17.4600	18.0420 (56)
If cylinder contains dedicated solar storage	18.0420	16.2960	18.0420	17.4600	18.0420	17.4600	18.0420	18.0420	17.4600	18.0420	17.4600	18.0420 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	192.6954	169.8777	179.4054	159.5912	153.3227	133.3012	125.7020	138.0749	139.1862	159.4302	172.4074	192.1629 (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	-13.0777	-27.7222	-55.7491	-84.8059	-113.1361	-114.1607	-112.6728	-94.6447	-68.5683	-39.8030	-17.4913	-10.3162 (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	179.6177	142.1554	123.6564	74.7852	40.1867	19.1406	13.0291	43.4302	70.6179	119.6272	154.9161	181.8467 (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	58.0723	51.0659	53.6533	47.2586	44.9808	38.5172	35.7969	39.9109	40.4740	47.0116	51.5200	57.8952 (65)

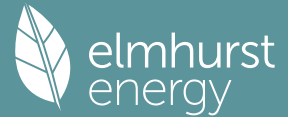
5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.1347	24.9890	20.3224	15.3854	11.5007	9.7094	10.4914	13.6371	18.3036	23.2407	27.1253	28.9166 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	271.8997	274.7212	267.6112	252.4748	233.3678	215.4100	203.4131	200.5916	207.7016	222.8380	241.9449	259.9028 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886 (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)	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634 (71)
Water heating gains (Table 5)	78.0541	75.9909	72.1147	65.6370	60.4581	53.4961	48.1142	53.6437	56.2138	63.1876	71.5555	77.8161 (72)
Total internal gains	469.3588	466.9713	451.3185	424.7674	396.5970	369.8858	353.2889	359.1427	373.4894	400.5365	431.8960	457.9058 (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	4.0500	10.6334	0.5100	0.0000	0.7700	16.9117 (74)						
South	4.0500	46.7521	0.5100	0.0000	0.7700	74.3561 (78)						
Solar gains	91.2678	154.0953	210.0394	263.5333	301.5255	303.0306	290.5542	261.0554	228.0719	169.8188	109.0001	78.3490 (83)
Total gains	560.6266	621.0667	661.3579	688.3007	698.1225	672.9165	643.8431	620.1981	601.5612	570.3553	540.8962	536.2548 (84)

7. Mean internal temperature (heating season)												
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	39.4114	39.4644	39.5165	39.7632	39.8097	40.0275	40.0275	40.0682	39.9433	39.8097	39.7157	39.6180
alpha	3.6274	3.6310	3.6344	3.6509	3.6540	3.6685	3.6685	3.6712	3.6629	3.6540	3.6477	3.6412
util living area	0.9585	0.9391	0.9063	0.8437	0.7374	0.5832	0.4402	0.4733	0.6700	0.8552	0.9372	0.9639 (86)
MIT	19.5146	19.7352	20.0504	20.4222	20.7304	20.9166	20.9771	20.9698	20.8569	20.4766	19.9296	19.4586 (87)
Th 2	20.0337	20.0349	20.0361	20.0415	20.0425	20.0472	20.0472	20.0481	20.0454	20.0425	20.0404	20.0383 (88)
util rest of house	0.9510	0.9283	0.8895	0.8152	0.6897	0.5110	0.3507	0.3830	0.6016	0.8230	0.9243	0.9573 (89)
MIT 2	18.3247	18.6006	18.9914	19.4441	19.7959	19.9880	20.0363	20.0327	19.9347	19.5186	18.8523	18.2579 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.7039	18.9622	19.3289	19.7558	20.0937	20.2840	20.3361	20.3313	20.2286	19.8239	19.1956	18.6405 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7039	18.9622	19.3289	19.7558	20.0937	20.2840	20.3361	20.3313	20.2286	19.8239	19.1956	18.6405 (93)

8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9377	0.9136	0.8749	0.8056	0.6924	0.5297	0.3785	0.4106	0.6156	0.8146	0.9102	0.9448 (94)
Useful gains	525.6964	567.3882	578.6442	554.5155	483.4040	356.4526	243.6695	254.6468	370.3172	464.5963	492.3091	506.6451 (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	972.4654	948.1157	863.8232	726.4358	561.0239	377.8394	248.3562	261.0680	408.2564	616.5102	810.3634	969.8536 (97)
Space heating kWh	332.3962	255.8488	212.1732	123.7827	57.7492	0.0000	0.0000	0.0000	0.0000	113.0239	228.9991	344.6271 (98a)
Space heating requirement - total per year (kWh/year)												1668.6002

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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	332.3962	255.8488	212.1732	123.7827	57.7492	0.0000	0.0000	0.0000	0.0000	113.0239	228.9991	344.6271 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1668.6002
Space heating per m2										(98c) / (4) =		26.1947 (99)

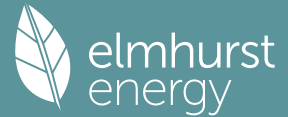
9a. Energy requirements - Individual heating systems, including micro-CHP

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 %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	332.3962	255.8488	212.1732	123.7827	57.7492	0.0000	0.0000	0.0000	0.0000	113.0239	228.9991	344.6271 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	332.3962	255.8488	212.1732	123.7827	57.7492	0.0000	0.0000	0.0000	0.0000	113.0239	228.9991	344.6271 (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	179.6177	142.1554	123.6564	74.7852	40.1867	19.1406	13.0291	43.4302	70.6179	119.6272	154.9161	181.8467 (64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month	179.6177	142.1554	123.6564	74.7852	40.1867	19.1406	13.0291	43.4302	70.6179	119.6272	154.9161	181.8467 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	24.6261	19.7560	17.7881	13.0323	10.0665	8.2244	9.1830	11.9364	15.5043	20.3424	22.9767	25.3105 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-37.3661	-54.9159	-80.5032	-88.5835	-88.6842	-72.0672	-71.0850	-67.5327	-60.7898	-59.4774	-41.2177	-32.1069 (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	1.8104	2.1384	0.1003	-7.9597	-21.2918	-32.8014	-32.3745	-27.0805	-19.4863	-3.1429	1.2426	1.6556 (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												1668.6002 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												100.0000
Water heating fuel used												1163.0091 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												198.7468 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-891.5194 (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												2138.8367 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1 (high-rate cost)	1668.6002	19.6000	327.0456 (240)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (electric off-peak tariff)			
High-rate fraction			0.0405 (243)
Low-rate fraction			0.9595 (244)
High-rate cost	47.0804	19.6000	9.2278 (245)
Low-rate cost	1115.9288	9.4000	104.8973 (246)
Energy for instantaneous electric shower(s)	0.0000	18.5800	0.0000 (247a)
Pumps, fans and electric keep-hot (0.90*19.60 + 0.10*9.40)	0.0000	0.0000	0.0000 (249)
Energy for lighting (0.90*19.60 + 0.10*9.40)	198.7468	18.5800	36.9272 (250)
Additional standing charges			7.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-754.3296	18.5800	-140.1544
PV Unit electricity exported	-137.1898	5.5900	-7.6689
Total			-147.8234 (252)
Total energy cost			337.2745 (255)

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11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.1170 (257)
SAP value		81.8933
SAP rating (Section 12)		82 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1 (high-rate cost)	1668.6002	0.1629	271.7945 (261)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (261)
Total CO ₂ associated with community systems			0.0000 (373)
Water heating - high rate cost	47.0804	0.1565	7.3688 (264)
Water heating - low rate cost	1115.9288	0.1314	146.6094 (264)
Space and water heating			425.7728 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	198.7468	0.1490	29.6172 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-754.3296	0.1405	-105.9541
PV Unit electricity exported	-137.1898	0.1035	-14.2007
Total			-120.1548 (269)
Total CO ₂ , kg/year			335.2352 (272)
CO ₂ emissions per m ²			5.2600 (273)
EI value			95.8674
EI rating			96 (274)
EI band			A

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	6.0000 (1b)	x 2.4000 (2b)	= 14.4000 (1b) - (3b)
First floor	57.7000 (1c)	x 2.4000 (2c)	= 138.4800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	152.8800 (5)

2. Ventilation rate

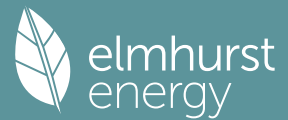
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	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) = 0.1308 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2808 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2387 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	3.8000	3.5000	3.7000	3.4000	3.5000	3.0000	3.1000	3.0000	3.0000	3.2000	3.1000	3.5000 (22)
Wind factor	0.9500	0.8750	0.9250	0.8500	0.8750	0.7500	0.7750	0.7500	0.7500	0.8000	0.7750	0.8750 (22a)
Adj infilt rate	0.2268	0.2089	0.2208	0.2029	0.2089	0.1790	0.1850	0.1790	0.1790	0.1910	0.1850	0.2089 (22b)
Effective ac	0.5257	0.5218	0.5244	0.5206	0.5218	0.5160	0.5171	0.5160	0.5160	0.5182	0.5171	0.5218 (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							
Ent Door			1.9600	1.1000	2.1560		(26a)
Windows			8.1000	1.0536	8.5345		(27)
Heatloss Floor 1			6.0000	0.1200	0.7200	75.0000	450.0000 (28a)
External Wall 1	66.7200	10.0600	56.6600	0.2000	11.3320	60.0000	3399.6000 (29a)
Planned Roof	57.7000		57.7000	0.0900	5.1930	9.0000	519.3000 (30)
Total net area of external elements Aum(A, m ²)			130.4200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.9355		(33)
Main dwelling							
Party Wall 1			36.9600	0.0000	0.0000	70.0000	2587.2000 (32)

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Party Floor 1	49.7000	30.0000	1491.0000 (32d)
Internal Wall 1	113.7600	9.0000	1023.8400 (32c)
Internal Floor 1	6.0000	18.0000	108.0000 (32d)
Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =		
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K	9578.9400 (34)		
List of Thermal Bridges	150.3758 (35)		
K1 Element	Length	Psi-value	Total
E16 Corner (normal)	7.2000	0.0570	0.4104
P1 Party wall - Ground floor	6.0000	0.3200	1.9200
E2 Other lintels (including other steel lintels)	6.9300	0.0480	0.3326
E3 Sill	6.0000	0.0450	0.2700
E4 Jamb	15.0000	0.0510	0.7650
E6 Intermediate floor within a dwelling	6.1000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	21.7000	0.0640	1.3888
E18 Party wall between dwellings	9.6000	0.0620	0.5952
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.4000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	9.4000	0.4800	4.5120
E10 Eaves (insulation at ceiling level)	21.7000	0.0840	1.8228
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	12.0168 (36)		
Point Thermal bridges	(36a) =		
Total fabric heat loss	(33) + (36) + (36a) =		
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	39.9523 (37)		
(38)m	Jan	Feb	Mar
Heat transfer coeff	26.5223	26.3256	26.4549
Average = Sum(39)m / 12 =	26.2636	26.3256	26.0337
	Jun	Jul	Aug
	26.0337	26.0885	26.0337
	Sep	Oct	Nov
	26.0337	26.1450	26.0885
	Dec	26.3256	(38)
	66.4746	66.2779	66.4073
	66.2159	66.2779	65.9860
	65.9860	66.0408	65.9860
	65.9860	66.0974	66.0408
	66.2779	66.0408	66.2779 (39)
	66.1724		
	Jan	Feb	Mar
HLP	1.0436	1.0405	1.0425
HLP (average)	1.0395	1.0405	1.0359
Days in mont	31	28	31
	30	31	30
	31	31	31
	30	31	31
	31	30	31
	30	31	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.0841 (42)											
Hot water usage for mixer showers	57.6681	56.7852	55.4841	53.4825	51.6891	49.1801	47.1957	49.5156	50.6824	53.1674	55.7553	57.6161 (42a)
Hot water usage for baths	24.9953	24.6180	24.0812	23.2773	22.5529	21.5556	20.7990	21.7242	22.2097	23.1979	24.2253	24.9754 (42b)
Hot water usage for other uses	35.9731	34.6650	33.3569	32.0488	30.7407	29.4325	29.4325	30.7407	32.0488	33.3569	34.6650	35.9731 (42c)
Average daily hot water use (litres/day)	109.0449 (43)											
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	118.6365	116.0682	112.9221	108.8086	104.9826	100.1683	97.4272	101.9804	104.9409	109.7222	114.6456	118.5647 (44)
Energy content (annual)	174.6534	153.5817	161.3634	142.1312	135.2807	115.8412	107.6600	120.0329	121.7262	141.3882	154.9474	174.1209 (45)
Distribution loss (46)m = 0.15 x (45)m	26.1980	23.0373	24.2045	21.3197	20.2921	17.3762	16.1490	18.0049	18.2589	21.2082	23.2421	26.1181 (46)
Water storage loss:												
Store volume	201.0000 (47)											
a) If manufacturer declared loss factor is known (kWh/day):	0.9700 (48)											
Temperature factor from Table 2b	0.6000 (49)											
Enter (49) or (54) in (55)	0.5820 (55)											
Total storage loss	18.0420	16.2960	18.0420	17.4600	18.0420	17.4600	18.0420	18.0420	17.4600	18.0420	17.4600	18.0420 (56)
If cylinder contains dedicated solar storage	18.0420	16.2960	18.0420	17.4600	18.0420	17.4600	18.0420	18.0420	17.4600	18.0420	17.4600	18.0420 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	192.6954	169.8777	179.4054	159.5912	153.3227	133.3012	125.7020	138.0749	139.1862	159.4302	172.4074	192.1629 (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	-16.7609	-29.4150	-58.5935	-90.9449	-116.6033	-126.4569	-123.9353	-107.4769	-77.5103	-46.4217	-21.9021	-13.3411 (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	175.9345	140.4626	120.8120	68.6463	36.7194	6.8444	1.7667	30.5980	61.6760	113.0084	150.5053	178.8219 (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	58.0723	51.0659	53.6533	47.2586	44.9808	38.5172	35.7969	39.9109	40.4740	47.0116	51.5200	57.8952 (65)

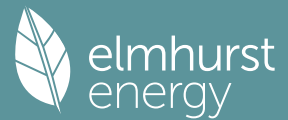
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451	125.0451 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.1347	24.9890	20.3224	15.3854	11.5007	9.7094	10.4914	13.6371	18.3036	23.2407	27.1253	28.9166 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	271.8997	274.7212	267.6112	252.4748	233.3678	215.4100	203.4131	200.5916	207.7016	222.8380	241.9449	259.9028 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886	49.5886 (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)	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634	-83.3634 (71)
Water heating gains (Table 5)	78.0541	75.9909	72.1147	65.6370	60.4581	53.4961	48.1142	53.6437	56.2138	63.1876	71.5555	77.8161 (72)
Total internal gains	469.3588	466.9713	451.3185	424.7674	396.5970	369.8858	353.2889	359.1427	373.4894	400.5365	431.8960	457.9058 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
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	m2		Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		factor Table 6d		W	
North	4.0500		12.7650		0.5100		0.0000		0.7700		20.3020	(74)
South	4.0500		54.2217		0.5100		0.0000		0.7700		86.2361	(78)

Solar gains	106.5381	157.2805	213.7331	274.6425	306.9440	327.4679	311.9001	285.5992	246.2680	186.2338	125.3438	91.9963	(83)
Total gains	575.8968	624.2518	665.0516	699.4099	703.5410	697.3538	665.1890	644.7419	619.7574	586.7703	557.2399	549.9021	(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	40.0275	40.1464	40.0682	40.1839	40.1464	40.3240	40.2905	40.3240	40.3240	40.2560	40.2905	40.1464	
alpha	3.6685	3.6764	3.6712	3.6789	3.6764	3.6883	3.6860	3.6883	3.6883	3.6837	3.6860	3.6764	
util living area	0.9488	0.9304	0.8873	0.8087	0.6809	0.4811	0.3334	0.3530	0.6036	0.8161	0.9210	0.9556 (86)	
MIT	19.6923	19.8701	20.2083	20.5545	20.8202	20.9639	20.9931	20.9914	20.9112	20.6058	20.0918	19.6296 (87)	
Th 2	20.0472	20.0497	20.0481	20.0505	20.0497	20.0535	20.0528	20.0535	20.0535	20.0521	20.0528	20.0497 (88)	
util rest of house	0.9394	0.9180	0.8669	0.7743	0.6252	0.4026	0.2425	0.2600	0.5284	0.7763	0.9047	0.9474 (89)	
MIT 2	18.5572	18.7792	19.1933	19.6050	19.8963	20.0324	20.0506	20.0507	19.9912	19.6739	19.0612	18.4810 (90)	
Living area fraction	18.9190	19.1269	19.5168	19.9076	20.1907	20.3292	20.3510	20.3505	fLA = Living area / (4) =				0.3187 (91)
MIT	18.9190	19.1269	19.5168	19.9076	20.1907	20.3292	20.3510	20.3505	20.2844	19.9709	19.3897	18.8470 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.9190	19.1269	19.5168	19.9076	20.1907	20.3292	20.3510	20.3505	20.2844	19.9709	19.3897	18.8470 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9255	0.9034	0.8537	0.7686	0.6340	0.4261	0.2715	0.2895	0.5476	0.7725	0.8909	0.9342	(94)
Useful gains	533.0203	563.9471	567.7877	537.5921	446.0261	297.1157	180.5696	186.6694	339.3822	453.2604	496.4684	513.7064	(95)
Ext temp.	5.0000	5.5000	7.4000	9.8000	12.7000	15.7000	17.6000	17.5000	14.8000	11.4000	7.8000	4.9000	(96)
Heat loss rate W	925.2580	903.1602	804.6411	669.2836	496.4699	305.4642	181.6766	188.0905	361.8912	566.5120	765.3903	924.3812	(97)
Space heating kWh	291.8249	227.9512	176.2189	94.8178	37.5302	0.0000	0.0000	0.0000	0.0000	84.2592	193.6237	305.5421	(98a)
Space heating requirement - total per year (kWh/year)												1411.7680	
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	291.8249	227.9512	176.2189	94.8178	37.5302	0.0000	0.0000	0.0000	0.0000	84.2592	193.6237	305.5421	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1411.7680	
Space heating per m2										(98c) / (4) =		22.1628	(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 %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	291.8249	227.9512	176.2189	94.8178	37.5302	0.0000	0.0000	0.0000	0.0000	84.2592	193.6237	305.5421	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	291.8249	227.9512	176.2189	94.8178	37.5302	0.0000	0.0000	0.0000	0.0000	84.2592	193.6237	305.5421	(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	175.9345	140.4626	120.8120	68.6463	36.7194	6.8444	1.7667	30.5980	61.6760	113.0084	150.5053	178.8219	(64)
Efficiency of water heater	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
Fuel for water heating, kWh/month	175.9345	140.4626	120.8120	68.6463	36.7194	6.8444	1.7667	30.5980	61.6760	113.0084	150.5053	178.8219	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	24.6261	19.7560	17.7881	13.0323	10.0665	8.2244	9.1830	11.9364	15.5043	20.3424	22.9767	25.3105	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-42.8691	-56.0577	-80.5854	-88.1456	-86.0290	-74.2472	-73.0894	-70.3702	-63.6818	-62.4247	-46.1830	-37.1588	(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)	1.6928	1.4602	-2.0633	-12.0974	-25.7207	-36.4275	-35.6955	-30.8418	-22.0779	-5.8073	0.6244	1.6650	(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												1411.7680	(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	100.0000	
Water heating fuel used	1085.7954	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	0.0000	(231)
Electricity for lighting (calculated in Appendix L)	198.7468	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-946.1310	(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	1750.1792	(238)

10a. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1 (high-rate cost)	1411.7680	34.6000	488.4717 (240)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (electric off-peak tariff)			
High-rate fraction			0.0405 (243)
Low-rate fraction			0.9595 (244)
High-rate cost	43.9546	34.6000	15.2083 (245)
Low-rate cost	1041.8407	15.8000	164.6108 (246)
Energy for instantaneous electric shower(s)	0.0000	32.7200	0.0000 (247a)
Pumps, fans and electric keep-hot (0.90*34.60 + 0.10*15.80)	0.0000	0.0000	0.0000 (249)
Energy for lighting (0.90*34.60 + 0.10*15.80)	198.7468	32.7200	65.0299 (250)
Additional standing charges			8.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-780.8419	32.7200	-255.4915
PV Unit electricity exported	-165.2891	5.8100	-9.6033
Total			-265.0948 (252)
Total energy cost			476.2261 (255)

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 (high-rate cost)	1411.7680	0.1635	230.8603 (261)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating - high rate cost	43.9546	0.1580	6.9460 (264)
Water heating - low rate cost	1041.8407	0.1327	138.2006 (264)
Space and water heating			376.0068 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	198.7468	0.1490	29.6172 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-780.8419	0.1407	-109.8856
PV Unit electricity exported	-165.2891	0.1073	-17.7308
Total			-127.6164 (269)
Total CO2, kg/year			278.0077 (272)

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 (high-rate cost)	1411.7680	1.6096	2272.3745 (275)
Space heating - main system 1 (low-rate cost)	0.0000	0.0000	0.0000 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating - high rate cost	43.9546	1.5896	69.8689 (278)
Water heating - low rate cost	1041.8407	1.4784	1540.2635 (278)
Space and water heating			3882.5069 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	198.7468	1.5547	309.0005 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-780.8419	1.5245	-1190.3877
PV Unit electricity exported	-165.2891	0.3927	-64.9054
Total			-1255.2931 (283)
Total Primary energy kWh/year			2936.2143 (286)

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