



Energy and Sustainability Statement

Land at 116 Norfolk Avenue, London N13 6AJ

PR10687

Date: 03/07/2023



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Executive summary

ERS Consultants Ltd has been appointed to prepare an Energy & Sustainability Statement for the 2 dwellings on Land at 116 Norfolk Avenue, London N13 6AJ.

This report will be focusing on the dwellings being proposed and look at implementing careful design and sustainable measures; so that the project creates attractive new residential units.

Proposed schedules of accommodation are as follows:

- Construction of 2 x 3-Bedroom Flats

Total combined internal floor area for the 2 dwellings: 164.96m²

(Drawings can be found in the appendix of this report)

This energy and sustainability report outlines the key measures to be incorporated in the design, in regards to sustainability, carbon emissions, renewable energy and environmental impact of the considered development in accordance and with guidance from the following documents and policies:

- Strategy for Greater London plan (March 2021)
- Haringey's Local Plan Strategic Policies 2013-2026 (SP4)

According to the Haringey's Local Plan Strategic Policies (Policy SP4), "All new residential development shall be zero carbon from 2016 onwards". Noting this factor and being in line with the Strategy for Greater London plan, the development would need to achieve a 35% reduction in regulated CO₂ emissions against a Building Regulations (Part L 2021) compliant scheme. Which is an 31% improvement from Part L 2013 baseline standards, so therefore this development is the equivalent of a 109.45% improvement over the previous building regulation standards, which now uses outdated carbon factors.

In addition to passive design and energy efficiency measures, this energy and sustainability statement will demonstrate that, highly-efficient Air Source Heat Pumps are going to provide heating and energy to the dwellings.

An energy simulation has been undertaken to establish the energy consumption and carbon emissions of the proposed building.

The methodology used to determine the expected operational CO₂ emissions for the development is in accordance with the the Strategy for Greater London plan three-step Energy Hierarchy and the CO₂ savings achieved for each step are outlined below:

Baseline – (CO₂ emissions Part L 2021 of the Building Regulation)

Initially in the energy assessment must be established that the regulated CO₂ emissions of the development comply with the Part L 2021 of the Building Regulations using the approved compliance software SAP. The total site-wide baseline CO₂ amounts to 4,265 kgCO₂/year.

Be Lean – Use less energy

The second step addresses reduction in energy demand, through the adoption of passive and active design measures with emphasis on a fabric first approach.

Emphasis will be put on the buildings fabric performance in order to reduce energy consumption, as less heating and cooling will be lost through the high performance fabric hence reducing the demand. Fabric first measures include levels of insulation beyond Building Regulation 2021 requirements which will help in achieving low air tightness levels.

With the addition of the be lean fabric improvements, the site wide reduction in CO₂ emissions from the baseline amounts to 68.84% (to 1,329 kgCO₂/year) for the development.

Be Clean – Supply energy efficiently

The space conditioning and hot water system network at the proposed development will consist of highly efficient Air Source Heat Pumps which shall serve as the main heating system. At this stage feasibility checks to see whether CHP can be installed are considered. However, due to the performance of the highly efficient ASHPs, CHPs are not deemed to be feasible for this development, therefore there are no further changes/CO₂ reductions to be made at the Be Clean stage.

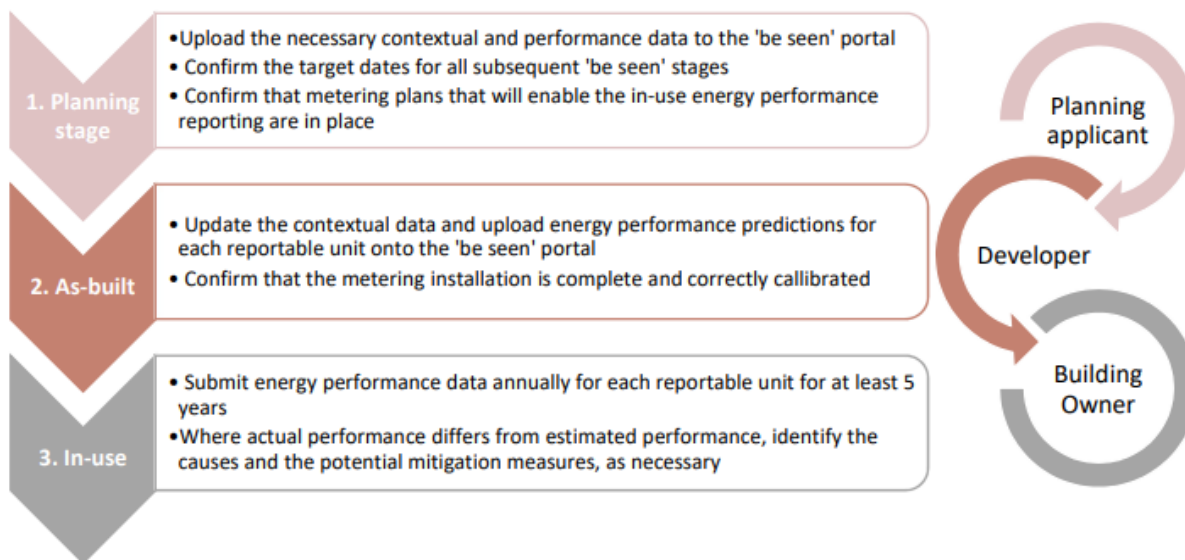
Be Green – Use renewable energy

The incorporation of the low-zero carbon heat pump will further reduce CO2 emissions on site by a further 9.61% (0.92 tonnes CO2/year) for the development.

The proposed building achieves a reduction of 78.45%, which fulfills the required 35.00% Carbon Emissions Reduction against Part L 2021 Building Regulations, in accordance with the Strategy for Greater London plan (March 2021). The proposed dwellings achieve a reduction of over 78%, thus meaning this proposed development using the proposed specification in this report completes the required **35% Carbon Emissions Reduction** against Part L1A, 2021 Building Regulations, in accordance with the Greater London plan (March 2021).

Be Seen – Monitor, Verify and Report

This is the post construction monitoring process that developer will need to report against the performance indicators at each stage of the process by downloading the 'be seen' reporting spreadsheet from the 'be seen' of the GLA's website. The online 'be seen' portal will be available later and applicants will be able to report via this portal instead of emailing information to the GLA.



Energy & carbon demand summary

Table 1 Energy and Carbon Reductions

	Energy Consumption (kWh/Year)	Energy Consumption Savings (%)	CO ₂ Emissions (kg CO ₂ /Year)	CO ₂ Emissions Savings (%)
Baseline	20,532		4,265	
Be Lean	8,875	56.78%	1,329	68.84%
Be Clean	8,875	0.00%	1,329	0.00%
Be Green	6,241	12.83%	919	9.61%
Total Reduction		69.61%		78.45%

Table 1. Breakdown of energy consumption and CO₂ emissions for the baseline and the proposed schemes after 'Lean' measures are implemented.

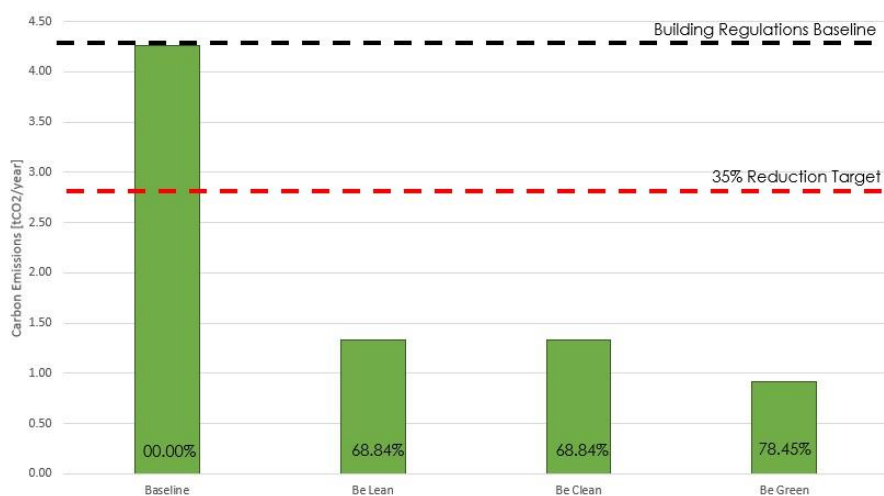


Fig.1 CO₂ Reduction

As shown in Table 1, the baseline annual energy consumption of the proposed development has been calculated to be 20,532 kWh/year, with the total carbon emissions being 4,265 kgCO₂/yr.

The incorporation of energy saving measures and low zero carbon technology, following the London plan 2021 Policy SI 2 local plan guidance, the site would reduce the energy requirement and CO₂ emissions to 6,241kWh/year and 919 kgCO₂/year, respectively.

The total reduction with "Be Green" measures would result in a total of 78.45% CO₂ reduction that is in comparison to the Part L 2021 Building regulations baseline as shown in Figure 1, achieving the required target.

Table 2. Proposed Specifications

Proposed Specifications		
Fabric	U-Value (W/m ² K)	New External Walls 0.18
		New Timber Wall 0.20
		Corridor Walls 0.20
		Existing Cavity Wall to be Improved 0.55
		Solid Wall to be improved 0.30
		Roof insulated at Joists 0.11
		New Flat Roof 0.15
		Existing Flat Roof to be improved 0.18
		Existing Roof insulated at Rafters to be improved 0.15
		Windows 1.40 Double glazed units, Low-E Soft Coat; (g-value:0.63)
		Door to Corridor 1.40 Solid
Air permeability	Q (m ³ /m ² h)	N/A
Space Heating	Gas-Fired Boilers	Mitsubishi Ecodan 8.5 kW PUHZ-W85VAA to radiators; Models assumed as an example for design purposes
Controls	Time and Temperature Zone Control;	
Water Heating	From Main Heating; Domestic 210 litre Hot Water Cylinder; Standing Heat Loss: 1.36kWh/day	
Thermal Bridging	N/A	

Lighting Systems	Lighting type	LED Lighting, throughout the dwelling;
Renewables	Photovoltaic Panels	None;
This specification is a recommendation but may change during the construction stage, to meet site constraints, any worsening of the u-values must ensure the required reduction in Carbon is met before completion;		

Introduction

Site & proposal

The site is located on Land at 116 Norfolk Avenue, London N13 6AJ.

The total development measures internally, approximately 164.96 m² in area. The approximate site plan of the proposed development is shown in the site plan Figure.2.



Site Location Plan
1:500

Fig.2 Site Plan

Policy context

This energy and sustainability statement will seek to respond to the energy policies that apply to this development. The most relevant applicable energy policies in the context of the proposed development are presented below.

- Strategy for Greater London plan (March 2021)
- Haringey's Local Plan Strategic Policies 2013-2026 (SP4)

All the aforementioned policies focus on zero carbon targets for residential developments with a minimum 35 per cent on site reduction beyond Part L 2021.

Calculation methodology

The sections below present the methodology followed in determining carbon emissions reduction savings for the proposed scheme.

The methodology employed by the energy and sustainability statement is in line with the GLA's Guidance on preparing energy assessments.

The baseline CO₂ emissions are first established, i.e. the emissions of a scheme that is compliant with Part L 2021 of the Building Regulations.

The approved software used to model and calculate the energy performance and carbon emissions is Design SAP 10 by Elmhurst Energy Systems Ltd.

The TER which is used as the baseline figure for the carbon reductions for each non-domestic element is multiplied by its floor area to establish the total emissions. Similarly, the DER is calculated in the same method to determine the energy performance and CO₂ emissions of the proposed scheme for each of the steps of the Energy Hierarchy.

Baseline:

The development's baseline uses the notional fabric specification and the heating system in the baseline model is the notional dwelling and target to better in the SAP calculations.

Be Lean: Use less energy

The demand for energy is reduced through a range of passive and active energy efficiency measures; as part of this step the development's fabric u-values, thermal bridging, air tightness and glazing have been improved to a high standard;

Be Clean: Supply energy efficiently

In this building there will be no direct heating networks or CHP incorporated, therefore the Be Clean scenario will not further reduce CO2 emissions on site.

Be Green: Renewable energy

Renewable technologies are incorporated to offset part of the carbon emissions of the development. The uptake of renewable technologies is based on feasibility and viability considerations, including their compatibility with the energy system determined in the previous step.

The implementation of the Energy Hierarchy determines the total regulated carbon savings that can be feasibly and viably achieved on site.

The 78.45% improvement for the flats against the baseline emissions is compared to the relevant targets for each element and in case of a shortfall; savings through off-site measures should be achieved.

The Conclusions section summarizes the energy strategy and associated carbon savings for the proposed development.

Be Seen:

This is the post construction monitoring process that developer will need to report against the performance indicators at each stage of the process by downloading the 'be seen' reporting spreadsheet from the 'be seen' of the GLA's website.

The Conclusions' section summarizes the energy strategy and associated carbon savings for the proposed development.

The carbon emissions factors used in all calculations in this document are those used for Part L of the Building Regulations. The relevant factors are reproduced in Table 7 below.

The carbon emissions factors used in all calculations in this document are those used for Part L of the Building Regulations. The relevant factors are reproduced in Table 3 below.

Table 3 Carbon Emission Factors for selected fuel type

Fuel	CO ₂ emission factor (kgCO ₂ /kWh)
Mains Gas-Baseline	0.210 kgCo2/kWh
Bulk LPG	0.241 kgCo2/kWh
Heating Oil	0.298 kgCo2/kWh
Wood Pellets	0.039 kgCo2/kWh
Grid Electricity-Proposed	0.233 kgCo2/kWh

Be Lean Passive design measures

Building materials

The key issues to be addressed in the selection of materials and equipment are:

- Use of materials and equipment from sustainable sources
- Minimization of in-use environmental impacts
- Minimization of embodied environmental impacts
- Use of materials and equipment with high recycled content

Enhanced U-values

The heat loss of different building fabric elements is dependent upon their U-value. A building with low U-Values provide better levels of insulation and reduced heating demand during the cooler months.

The proposed development will incorporate high levels of insulation and high-performance glazing beyond Part L 2021 targets and notional building specifications, to reduce the demand for space conditioning (heating and/or cooling).

Table 4 demonstrates the improved performance of the proposed building fabric beyond the Building Regulations requirements.

Table 4 Proposed fabric U-Values

Domestic (U-Values in W/m ² k)		
Element	Part L 2021	Proposed
Wall	0.70	0.18 [New External Walls] 0.20 [New Timber/Corridor Wall] 0.55 [Cavity Wall to be improved] 0.30 [Solid Wall to be improved]
Floor	0.70	Not determined
Roof	0.35	0.11 [Pitched Roof insulated at Joists] 0.15 [New Flat Roof] 0.18 [Existing Flat Roof to be improved] 0.15 [Existing Roof insulated at Rafters to be improved]
Windows	1.60	1.40
Door	1.60	1.40 [Door to Corridor]
These u-values are recommended but may change during the construction stage, to meet site constraints, any worsening of the u-values must ensure the required reduction in Carbon is met before completion;		

Reducing the need for artificial lighting

The development has been designed to maximise daylight in all habitable spaces as a way of improving the health and wellbeing of its occupants.

All of the habitable areas will benefit from large areas of glazing to increase the amount of daylight within the internal spaces where possible. This is expected to reduce the need for artificial lighting whilst delivering pleasant, healthy spaces for occupants.

Waste

A site waste management plan that provides details of waste minimisation, sorting, reuse and recycling procedures is required for all levels in the planning guidance. Sustainable waste management should follow the hierarchy described in *BS 5906: Waste management in buildings. Code of practice*. This outlines the following principles in decreasing order of desirability:

- Reduce waste
- Re-use materials and equipment (and facilitate future reuse)
- Recycle waste (and facilitate recycling)
- Compost biodegradable waste
- Recover energy from waste (and facilitate energy recovery from waste)
- Disposal

Active design measures

High efficiency & low energy lighting

Where artificial lighting will be needed it will be low energy lighting without compensating for luminance, and will accommodate LED.

Water Efficiency Measures

The following measures can be used to reduce the quantity of water demand to satisfy end users:

- Dual or low flush WCs
- Spray or aerating taps
- Water efficient appliances
- Low flow showers
- Smaller size bath

Water Reclamation / Recycling Measures

- Rainwater collection

Water collected from roofs or hard surfaces such as car parks can be harvested for storage and use for non-potable uses such as watering gardens and WC flushing.

Controls and Monitoring

Advanced lighting and space conditioning controls will be incorporated, specifically:

- For areas of infrequent use, occupant sensors will be fitted for lighting, whereas day lit areas will incorporate daylight sensors where appropriate;
- Heating and cooling systems controls will comprise time and temperature controls, both centrally for the whole building, and locally for each space;
- Smart metering to be installed on all new dwellings for adequate monitoring;

Be Lean CO₂ emissions & savings

With the addition of the be lean fabric improvements, the site wide reduction in CO₂ emissions from the baseline amounts to 68.84% (to 1,329 kgCO₂/year) for the development.

Be Clean – Supply energy efficiently

In this building there will be no direct heating networks or CHP incorporated, therefore the Be Clean scenario will not further reduce CO₂ emissions on site.

Be Green –Renewable energy

Renewable technologies feasibility study

Methods of generating on-site renewable energy (Green) were assessed, once Lean and Clean measures were considered.

This section provides an overview of the technologies considered, a brief assessment of their feasibility, a proposed mixture of suitable technologies.

The proposed development will benefit from an energy efficient building fabric which will reduce the energy consumption of the proposed development in the first instance.

A range of renewable technologies were subsequently considered including:

- Biomass;
- Ground/water source heat pumps;
- Wind energy;
- Photovoltaic panels, and,
- Solar thermal panels.

In determining the appropriate renewable technology for the site, the following factors were considered:

- CO₂ savings achieved;
- Site constraints;
- Financial benefit
- Any potential visual impacts

Demand profiles

The balance of technologies chosen will depend on the development's energy demand patterns. Keeping in mind that the space heating energy demand changes according to the season. While hot water energy demand will provide a significant base load throughout the year.

Electrical demand is likely to be moderate throughout the year. Lighting loads will be highest during the evening but will continue at reduced levels throughout the night and during the day.

Feasibility

At this early stage in the design, it is possible only to outline the likely feasibility of specific technologies. Further descriptions of the LZC technologies below are included in Appendix A.

Table 5. Renewable and Low Zero Carbon Technologies

Renewable Technology	Comments	Lifetime (Years)	Maintenance	Impact on External Appearance	Site Feasibility	Adopted for Site
BIOMASS 	Burning of wood pellets releases high NOx emissions and there are limitations for their storage and delivery within an urban location.	20	High	High	3	☐
PV 	PV panels would generate significant carbon savings, but due to excess shading caused by neighboring properties and a lack of suitable roof space, this is not a feasible option.	25	Low	High	3	☐
Solar Thermal 	Solar thermal array mounted on the roof would conflict with the savings made from the proposed low-zero carbon technology and have a large impact on external appearance.	25	Low	High	4	☐
ASHP 	Ground loops require space and additional time at the beginning of the construction process and very high capital costs, however, the air source heat pump solution is a viable and cost-effective solution to meet the required carbon reductions.	20	Med	Low	9	☒
Wind 	Due to insufficient open area for installation of a stand-alone wind turbine and planning issues this option has not considered in this development.	25	Med	High	3	☐

Detailed assessment of air source heat pump (chosen option)

An air source heat pump is an excellent technology to utilize as the main heating system of an energy statement due to its numerous environmental and energy-efficient benefits. Here are some reasons why this technology is recommended:

1. **Renewable Energy Source:** Air source heat pumps extract heat energy from the ambient air, even in cold weather conditions. Unlike fossil fuel-based heating systems, they rely on renewable energy, reducing dependency on finite resources and decreasing greenhouse gas emissions.
2. **Reduced Carbon Footprint:** By utilizing the heat from the air, air source heat pumps produce significantly lower carbon emissions compared to conventional heating systems. This contributes to mitigating climate change and improving air quality.
3. **Energy Efficiency:** Air source heat pumps operate by transferring heat rather than generating it through combustion, making them highly energy-efficient. They typically achieve a Coefficient of Performance (COP) of over 3, meaning they can produce three units of heat energy for every unit of electricity consumed.
4. **Lower Energy Consumption:** Air source heat pumps require less energy to operate compared to traditional heating systems, such as electric resistance heaters or oil-fired boilers. This leads to reduced energy consumption, lower utility bills, and cost savings for users.
5. **Versatility and Convenience:** Air source heat pumps can provide both heating and cooling functions, offering year-round comfort in residential and commercial settings. They can also integrate with existing heating systems, allowing for smooth retrofitting.
6. **Long Lifespan and Durability:** When properly installed and maintained, air source heat pumps can have a lifespan of 15 to 20 years or more. This longevity contributes to their sustainability by reducing the need for frequent replacements and associated resource consumption.

By incorporating air source heat pumps in the energy statement, individuals and developers alike can significantly reduce their environmental impact, decrease energy consumption, and contribute to a more sustainable future.

Detailed assessment of Photovoltaic Panels

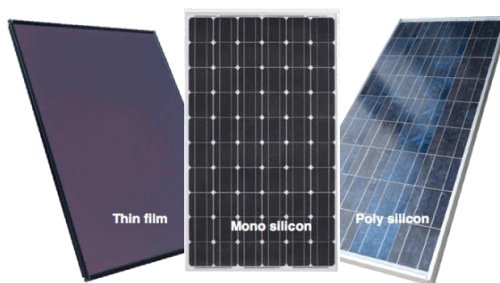


Fig 4. Photovoltaic Panels

Four types of solar cells are available on the market at present and these are mono-crystalline, polycrystalline, thin film and hybrid panels as seen in figure 4. Although mono-crystalline and hybrid cells are the most expensive, they are also the most efficient with an efficiency rate of 12-20%. Poly-crystalline cells are cheaper but they are less efficient (9-15%). Thin film cells are only 5-8% efficient but can be produced as thin and flexible sheets.

1.00 kWp (Kilo Watt Peak) of PV panels can produce approximately 850 kWh/ year of electricity in this region, reducing the grid energy requirement and CO₂ emissions.

Photovoltaic Panel is not considered a suitable technology for this development as the development provides an extent of roof space that will be impacted heavily by shading and the low efficient angles make this.

Be Green CO₂ emissions & savings

The incorporation of renewable technologies will reduce CO₂ emissions for the development by 78.45% (to 919kgCO₂/year) from the baseline.

Conclusion

Following the implementation of the three-step Energy Hierarchy, the regulated CO₂ savings for the site are calculated to be 78.45% for the development, against a Part L 2021 compliant scheme. Which is an 31% improvement from Part L 2013 baseline standards, so therefore this development is the equivalent of a 109.45% improvement over the previous building regulation standards, which now uses outdated carbon factors.

Therefore, the proposed development has been designed to meet energy policies set out by the Strategy for Greater London plan (March 2021) plan requirements, which demonstrates the client and the design team's commitment to enhancing sustainability of the scheme.

Furthermore, the project is achieving compliance in accordance with the current Part L 2021 regulations (SAP 10).

Table 6. Summarizes the implementation of the Energy Hierarchy for the proposed scheme and detail the CO₂ emissions and savings against the baseline scheme for each step of the hierarchy; as well as the savings achieved through carbon offset, in addition to this a total site average is calculated, this average meets the 39% Carbon reduction over a Part L1A 2021 baseline, requirements as set by the Greater London plan.

Table 6. CO₂ emissions after each step of the Energy Hierarchy for the proposed development

Site wide reduction	CO ₂ Emissions (kg CO ₂ /Year)	CO ₂ Emissions Savings per step (%)
Baseline	4,265	
Be Lean	1,329	68.84%
Be Clean	1,329	0.00%
Be Green	919	9.61%
Total Site Reduction achieved		78.45%

Based on the results and outline figures, the proposed development will satisfy the relevant policies for sustainable design and construction requirements of energy consumption and carbon emissions.

The energy demand and carbon emissions, could be reduced by introducing a combination of highly efficient Air Source Heat Pumps. Based on the calculations and results achieved when those measures were applied, the development achieved a total site reduction of 78.45% in CO₂ emissions based on the 2021 Regulations (Figure 3).

The new dwellings will be designed with a high level of insulation and low air permeability to reduce heat loss as much as is practically possible, also the use of low energy lighting and A – Rated White goods are essential for the reduction of energy consumption.

Moreover, the control strategy throughout must be carefully designed to ensure the most economical operation of all equipment throughout the development.

To achieve the required reduction of carbon emissions, several options were considered, however the best option in regards to site location and the development size was the combination of Air Source Heat Pumps and sufficient thermal fabric specification.

The proposed development site is not in a close proximity of an existing heat network making this an unviable solution to improve the heating system in the dwelling at time of this application.

The dwellings are to have suitable meter/smart meter management installed on every household, so that the homeowner can benefit from accurate savings to allow for suitable management of energy usage.

The baseline annual energy consumption of the dwellings on this development has been calculated to be 20,532kWh/yr and 4,265KgCO₂/yr of CO₂ emissions. By incorporating renewable and low carbon technologies, the total CO₂ emissions will be reduced to 919KgCO₂/yr, equivalent to 78.45% reduction over Part L 2021 requirements.

Different possible renewable energy options have been identified; bearing in mind that selection is a complex process which requires a more detailed estimation of energy demand patterns, therefore, further analysis will be undertaken as the design progresses should the proposed system and specification become unfeasible.

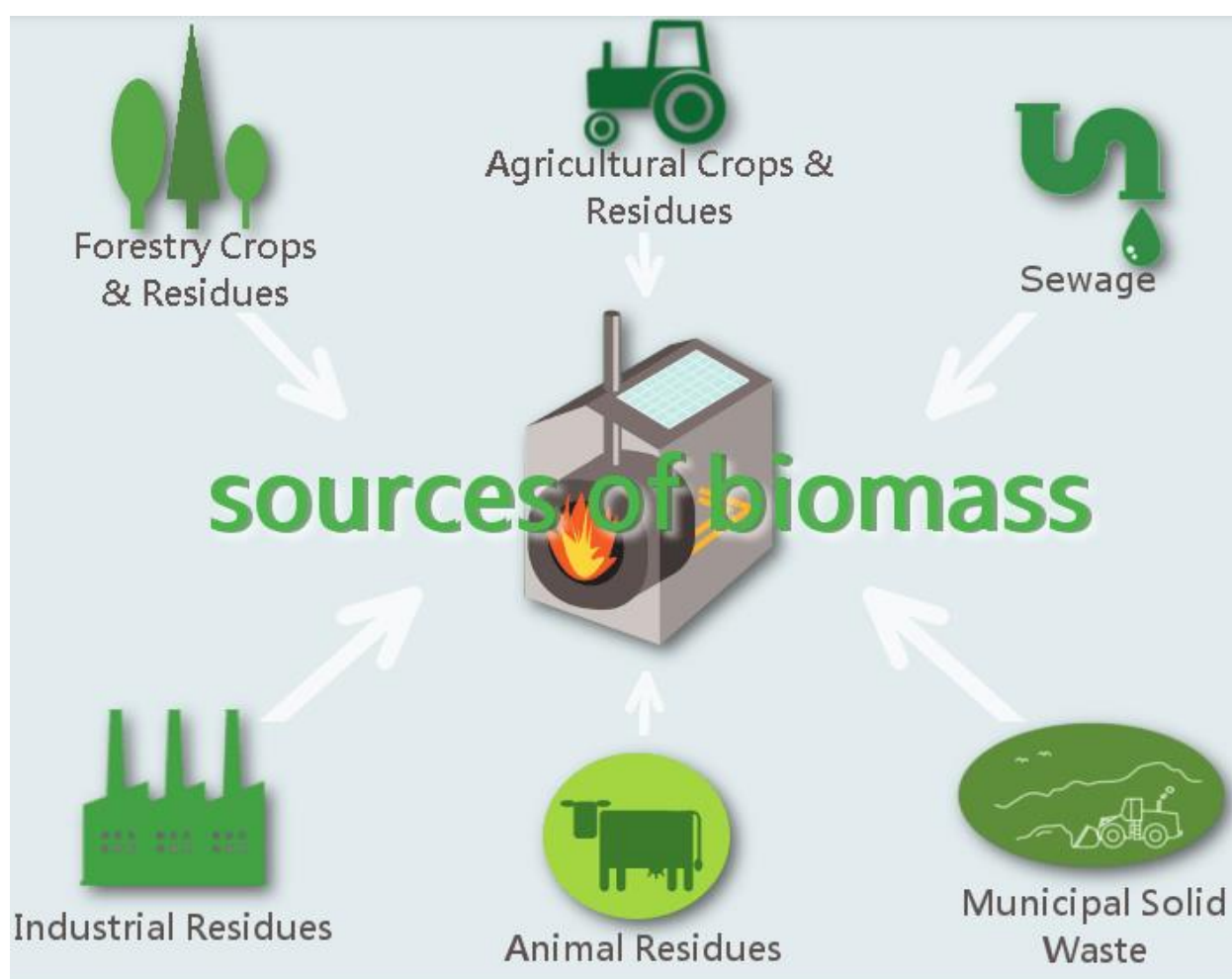
The flats satisfy the requirements of this document and building regulation standards at the time of completion, this is to be provided as As-Built SAP worksheet and EPC.

Appendix A - Low or Zero Carbon Energy Sources

Biomass As a fuel

Biomass is a renewable energy source, generated from burning wood, plants and other organic matter, such as manure or household waste. It releases CO₂ when burned, but considerably less than fossil fuels. We consider biomass a renewable energy source, if the plants or other organic materials being burned are replaced.

Biomass is known for its versatility, given it can be used to generate heat, electricity, be used in combined heat and power units and be used as liquid fuel. In domestic settings, it tends to be found in the form of wood-fuelled heating systems.



Geothermal Energy:

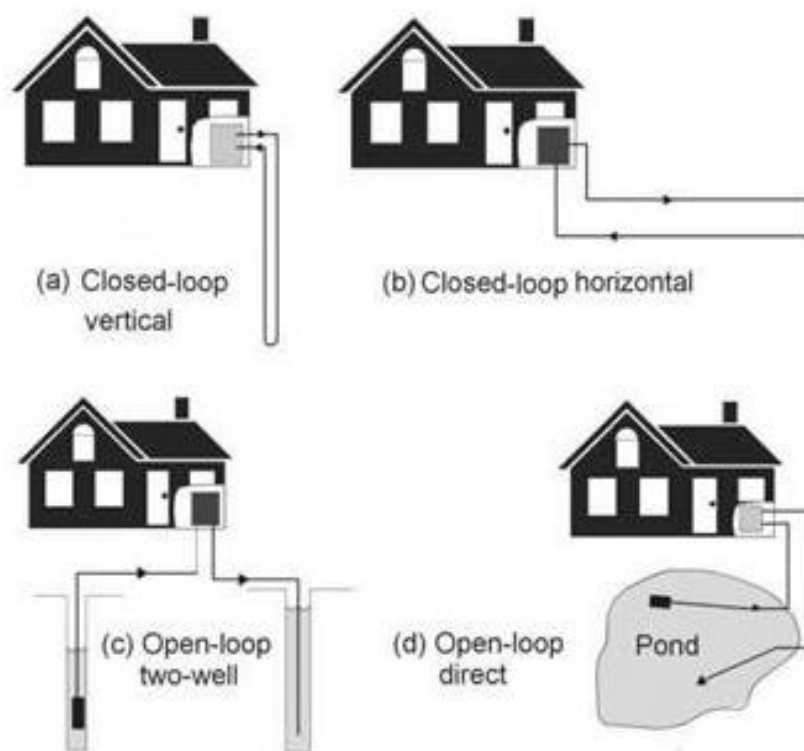
Geothermal energy technologies use the heat energy stored in ground; either for direct-use applications: such as using the grounds' heat to defrost a driveway or the indirect use with additional equipment such as a geothermal heat pump. Most

commercial installations couple a heat pump with the ground to upgrade the low-grade heat from the ground or ground water to a higher-grade heat, where it can be used for heating purposes.

The suitability of a ground source system depends heavily on the type of earth coupling heat exchange system used:

Ground source earth coupling options

The right choice of appropriate heat exchanger depends on several factors such as: size of space heating/hot water system, available site area for the heat exchangers, and local ground conditions. Due to the specialist nature of this technology, we recommend that a specialist is employed to size the heat exchangers based on a desk-top study of the site's geological conditions – this normally being required in advance of any other contractor appointment.



Vertical Closed Loop System

A frequently used and simple ground source heat exchanger, for a small to medium size project, is a closed loop vertical system. The system comprises of vertically drilled boreholes, usually up to 100 m deep, into which are inserted two polyethylene pipes with a U-shape connector at the base of the hole – effectively providing a flow down to the bottom of the hole and return back up to the surface. All the flow and return loops

are connected together across the site - completing the entire heat exchange loop. Water is pumped around the loop and is then circulated around the heat pump to achieve the required heat exchange. The distance between boreholes is dependent on ground conditions but is typically a minimum of a 6mx6m grid, to prevent overlapping of the heat exchange process between loops.

Horizontal Closed Loop System

Horizontal closed loop heat exchangers are usually applied to small projects such as individual houses, which usually require a relatively low heat output. Consisting of horizontal trenches 1.5-2m deep, with either straight pipes or 'slinky' coiled pipes, these require significant excavation work and significant site area to achieve appreciable outputs as such are not normally suited to medium to large projects.

Vertical Open Boreholes System

A further option is a vertical open borehole system. The system involves the abstraction and discharge of natural ground water using boreholes; into which pumps are inserted, connected to collapsible pipework. Each borehole pump abstracts ground water, circulates it around the heat pump and then discharges the water back to the ground via an absorbing well, some distance from the original abstraction borehole. The system is capable of providing very high rates of heat exchange for a relatively small number of boreholes, which makes it very efficient in terms of site area required. However, this depends greatly on the availability of ground water, which in turn varies according to location. A major downside of this system is that the extraction of water from deep boreholes via pumps consumes a lot of energy, as the water has to be physically lifted to the surface by the pump – this in effect reduces the carbon emissions saved by this system as a whole.

Ground source heat exchange options in summary:

Vertical loop system - closed boreholes

- moderate heat capacity
- relatively low installation cost

Vertical open system - open boreholes

- high heat capacity
- high running energy
- high installation cost

Horizontal loop system – straight pipes

- low capacity,
- high installation cost
- extensive ground excavation work

Horizontal coiled loop system – ‘slinky’ pipes

- good capacity
- low installation cost
- extensive ground excavation work

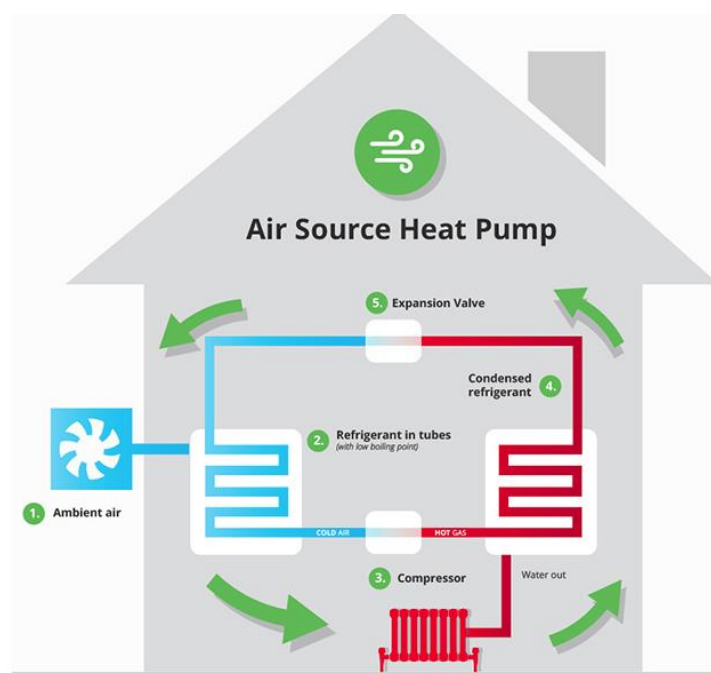
Air Source Heat Pumps

Heat pumps are basically refrigeration units which work in reverse – instead of cooling being produced and heat rejected, the unit produces heat and rejects cooling.

Conventional heat pumps use air as the medium to reject this ‘coolth’ to atmosphere. Ground source units use the ground as a means of improving the unit efficiency because the ground is a constant 11-13 °C at depths of 50m down – this suits the heat pump much better during the coldest weather than the extremes of air temperature. Reversible heat pumps can also be used for cooling, however this is not being considered further for this project.

A heat pump consumes electrical power to drive the compressor and other ancillary elements. The ratio between total energy input and heat energy output of the heat pump is a measure of its efficiency – usually referred to as ‘Coefficient of Performance’ - COP. A ground source heat pump has a higher COP than an air cooled heat pump – this additional energy effectively being the grounds’ natural contribution to the system.

The heat produced by a heat pump is usually used to either provide space heating say to underfloor heating or radiators or the heat is used to generate domestic hot water via a storage vessel.

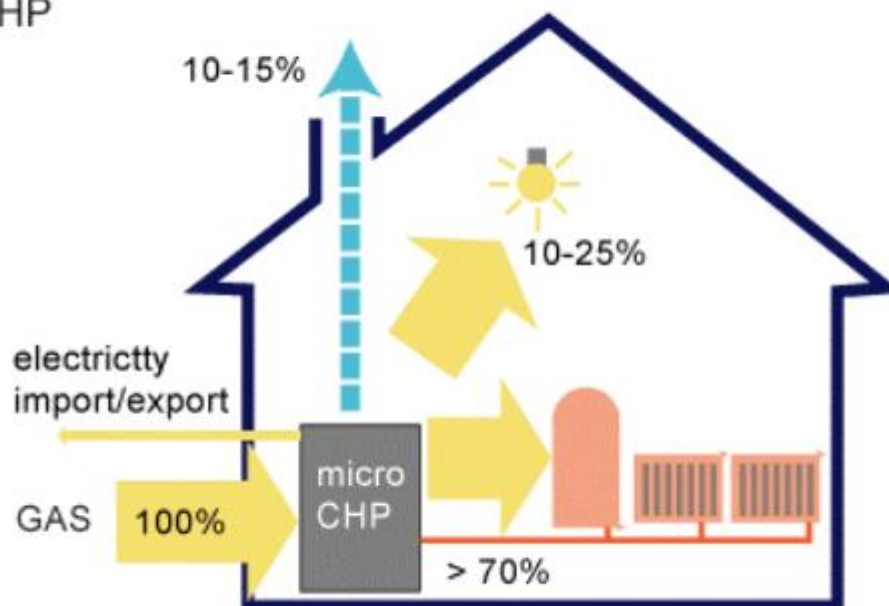


CHP

Combined heat and power (CHP) is a process involving simultaneous generation of heat and electricity, where the heat generated in the process is harnessed via heat recovery equipment. CHP at the large commercial size is now fairly common in premises which have a simultaneous demand for heating and electricity for long periods, such as hospitals, recreational centres and hotels. In addition, small CHP systems are now becoming available for individual houses, group residential units and small non-domestic premises. Compared with using centrally generated electricity supplied via the grid, CHP can offer a more efficient and economic method of supplying energy demand, if installed and operated appropriately, owing to the utilization of heat which is normally rejected to the atmosphere from central generating stations, and by reducing network distribution losses due to local generation and use.

Heat generated will be used for space and water heating, and additional heat storage may be used to lengthen use periods, to assist in warm-up and to improve overall energy efficiency. For overall good energy efficiency, as with all CHP, usage must be heat demand led. Thus, a sophisticated control system is required and users should be made aware of efficient operating practices.

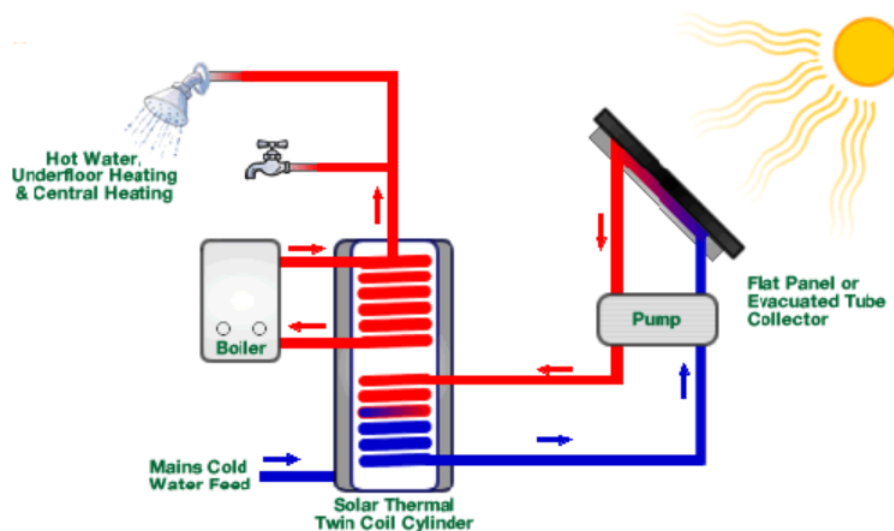
Micro CHP



Solar thermal collectors

Solar thermal collectors (flat plate or evacuated tubes) convert solar thermal energy into heat for hot water generation. These are usually located on a roof oriented south

facing in an ideal slope of 45 degree. Solar collectors properly sized and designed provide approx 50% of annual hot water demand.



Photovoltaic

Photovoltaic modules convert sunlight directly into DC electricity and can be integrated into buildings. Photovoltaics (PVs) are distinct from other renewable energy technologies since they have no moving parts to be maintained and are silent. PV systems can be incorporated into buildings in various ways: on sloped roofs and flat roofs, in façades, atria and shading devices. Modules can be mounted using frames or they can be fully incorporated into the actual building fabric; for example, PV roof tiles are now available which can be fitted in place of standard tiles.



Currently, a PV system will cost between £1500 and £2500 per kWp, and frequently part of this cost can be offset owing to the displacement of a conventional cladding

material. Costs have fallen significantly since the first systems were installed (1980s) and are predicted to fall further still.

While single crystal silicon remains the most efficient flat plate technology (15–16% conversion efficiency); it also has the least potential for cost reduction. PV cells made from poly-crystalline silicon have become popular as they are less expensive to produce, although they have a slightly lower efficiency.

Thin film modules are constructed by depositing extremely thin layers of photosensitive materials on a low-cost backing such as glass, stainless steel or plastic. As much less semiconductor material is required as for crystalline silicon cells, material costs are potentially much lower. Efficiencies are much lower, around 4–5%, although this can be boosted to 8–10% by depositing two or three layers of thin film material. Thin film production also requires less handling as the films are produced as large, complete modules and not as individual cells that have to be mounted in frames and wired together. Hence, there is the potential for significant cost reductions with volume production.

Since PVs generate DC output, an inverter and other equipment is needed to deliver the power to a building or the grid in an acceptable AC form. The cost of the inverter and these 'Balance of System' (BOS) components can approach 30% of the total cost of a PV system. Hence, simplification and cost reductions in these components over the coming years will also be necessary to make PV systems affordable.

Wind energy

Wind power is the most successful and fastest spreading renewable energy technology in the UK with a number of individual and group installations of varying size, capacity and location. Traditionally, turbines are installed in non-urban areas with a strong trend for large offshore wind farms. In parallel with the design and development of ever-bigger machines, which are deemed to be more efficient and cost-effective, it is being increasingly recognized that smaller devices installed at the point of use, i.e. urban settings, can play an important role in reducing carbon emissions if they become mainstream.



At present there is a wide range of available off-the-shelf wind products, many manufactured in the UK and EU with proven good performance and durability. The

dominant type is horizontal axis wind turbines (HAWT), which are typically ground mounted. Vertical axis wind turbines (VAWT) have limited market presence and there is a trade-off between lower efficiency and potentially higher resistance to extreme conditions. Capacity ranges from 500W to more than 1.5MW, but, for practical purposes and in built-up areas in particular, machines of more than 1kW and below 500kW are likely to be considered.

Wind technology is also currently one of the most cost-effective renewable energy technologies, which is attributable to the large scale of installations reducing the unit output cost. Individual building or community wind projects, although smaller, have the advantage of feeding electricity directly into the building's electricity circuit, thus sparing costly distribution network development and avoiding distribution losses. The downside is the still high capital cost per kW installed for smaller turbines, plus location constraints, such as visual intrusion and noise. The wind regime in urban areas is also a concern owing to higher wind turbulence which reduces the potential electricity output.

In most cases, wind turbines are connected to the electricity grid and all generated energy is used regardless of the building demand fluctuations. The output largely depends on the wind speed and the correlation between the two is a cube function. This means that in short periods of above-average wind speeds the generation increases exponentially. As a result, it is difficult to make precise calculations of the annual output of a turbine, but average figures can provide useful guidance to designers and architects. In reasonably windy areas (average wind speed of 6m/s) the expected output from 1kW installed is about 2500kWh annually.

The cost per kW installed varies considerably by manufacturer and size of machine with an indicative bracket of £2,500–£5,000. With a lifespan of more than 20 years, wind turbines can save money if design and planning are carried out in a robust way.

Building-integrated wind turbines are starting to be a reality in the UK, but potential projects may face difficulties with obtaining planning permission. There are a few examples now of permitted development rights for certain rooftop turbines in some local councils. A number of horizontal axis devices specifically designed for building integration are now available commercially, having design and reliability parameters relevant to the urban context. Building-mounted vertical axis devices are under development. At present, turbines installed near buildings, as well as community installations for groups of buildings, should be regarded as the larger wind energy source related to buildings, when they contribute to the carbon emissions from these premises using 'private wire' networks. However, the contribution of several building-integrated turbines in a development is likely to become significant in the next few years.

Appendix B-Fuel prices and emission factors

Table 12: Fuel prices, emission factors and primary energy factors

Fuel	Standing charge, £ ^(a)	Unit price p/kWh	Emissions kg CO ₂ per kWh ^(b)	Primary energy factor	Fuel code
Gas:					
mains gas	120	3.48	0.216	1.22	1
bulk LPG	70	7.60	0.241	1.09	2
bottled LPG		10.30	0.241	1.09	3
LPG subject to Special Condition 18 ^(c)	120	3.48	0.241	1.09	9
biogas (including anaerobic digestion)	70	7.60	0.098	1.10	7
Oil:					
heating oil		5.44	0.298	1.10	4
biodiesel from any biomass source ^(d)		7.64	0.123	1.06	71
biodiesel from vegetable oil only ^(e)		7.64	0.083	1.01	73
appliances able to use mineral oil or biodiesel		5.44	0.298	1.10	74
B30K ^(f)		6.10	0.245	1.09	75
bioethanol from any biomass source		47.0	0.140	1.08	76
Solid fuel: ^(g)					
house coal		3.67	0.394	1.00	11
anthracite		3.64	0.394	1.00	15
manufactured smokeless fuel		4.61	0.433	1.21	12
wood logs		4.23	0.019	1.04	20
wood pellets (in bags for secondary heating)		5.81	0.039	1.26	22
wood pellets (bulk supply for main heating)		5.26	0.039	1.26	23
wood chips		3.07	0.016	1.12	21
dual fuel appliance (mineral and wood)		3.99	0.226	1.02	10
Electricity: ^(a)					
standard tariff	54	13.19	0.519	3.07	30
7-hour tariff (high rate) ^(h)	24	15.29	0.519	3.07	32
7-hour tariff (low rate) ^(h)		5.50	0.519	3.07	31
10-hour tariff (high rate) ^(h)	23	14.68	0.519	3.07	34
10-hour tariff (low rate) ^(h)		7.50	0.519	3.07	33
18-hour tariff (high rate) ^(h)	40	13.67	0.519	3.07	38
18-hour tariff (low rate) ^(h)		7.41	0.519	3.07	40
24-hour heating tariff	70	6.61	0.519	3.07	35
electricity sold to grid		13.19 ⁽ⁱ⁾	0.519	3.07	36
electricity displaced from grid			0.519 ⁽ⁱ⁾	3.07 ⁽ⁱ⁾	37
electricity, any tariff ⁽ⁱ⁾					39
Community heating schemes: ^(k)	120 ^(l)				
heat from boilers – mains gas		4.24	0.216	1.22	51
heat from boilers – LPG		4.24	0.241	1.09	52
heat from boilers – oil		4.24	0.331 ^(m)	1.10	53
heat from boilers that can use mineral oil or biodiesel		4.24	0.331	1.10	56
heat from boilers using biodiesel from any biomass source		4.24	0.123	1.06	57
heat from boilers using biodiesel from vegetable oil only		4.24	0.083	1.01	58
heat from boilers – B30D ^(f)		4.24	0.269	1.09	55
heat from boilers – coal		4.24	0.380 ⁽ⁿ⁾	1.00	54
heat from electric heat pump		4.24	0.519	3.07	41
heat from boilers – waste combustion		4.24	0.047	1.23	42
heat from boilers – biomass		4.24	0.031 ^(o)	1.01	43
heat from boilers – biogas (landfill or sewage gas)		4.24	0.098	1.10	44
waste heat from power station		2.97	0.058 ^(p)	1.34	45
geothermal heat source		2.97	0.041	1.24	46
heat from CHP		2.97	as above ^(q)	as above ^(q)	48
electricity generated by CHP			0.519 ⁽ⁱ⁾	3.07 ⁽ⁱ⁾	49
electricity for pumping in distribution network			0.519	3.07	50

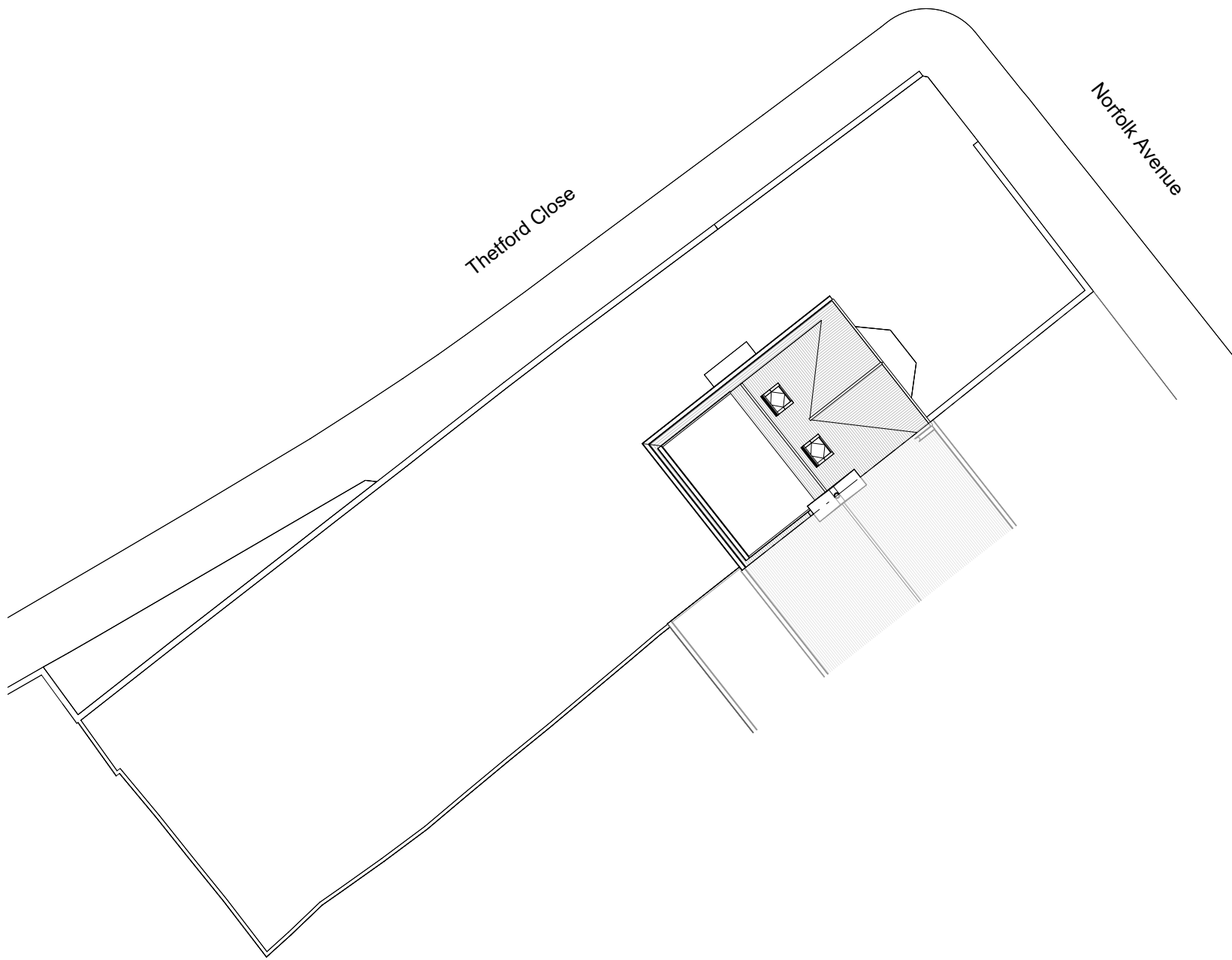
Appendix C, D and E

This appendix contains the following reports used in producing the content of this Energy and Sustainability Statement.

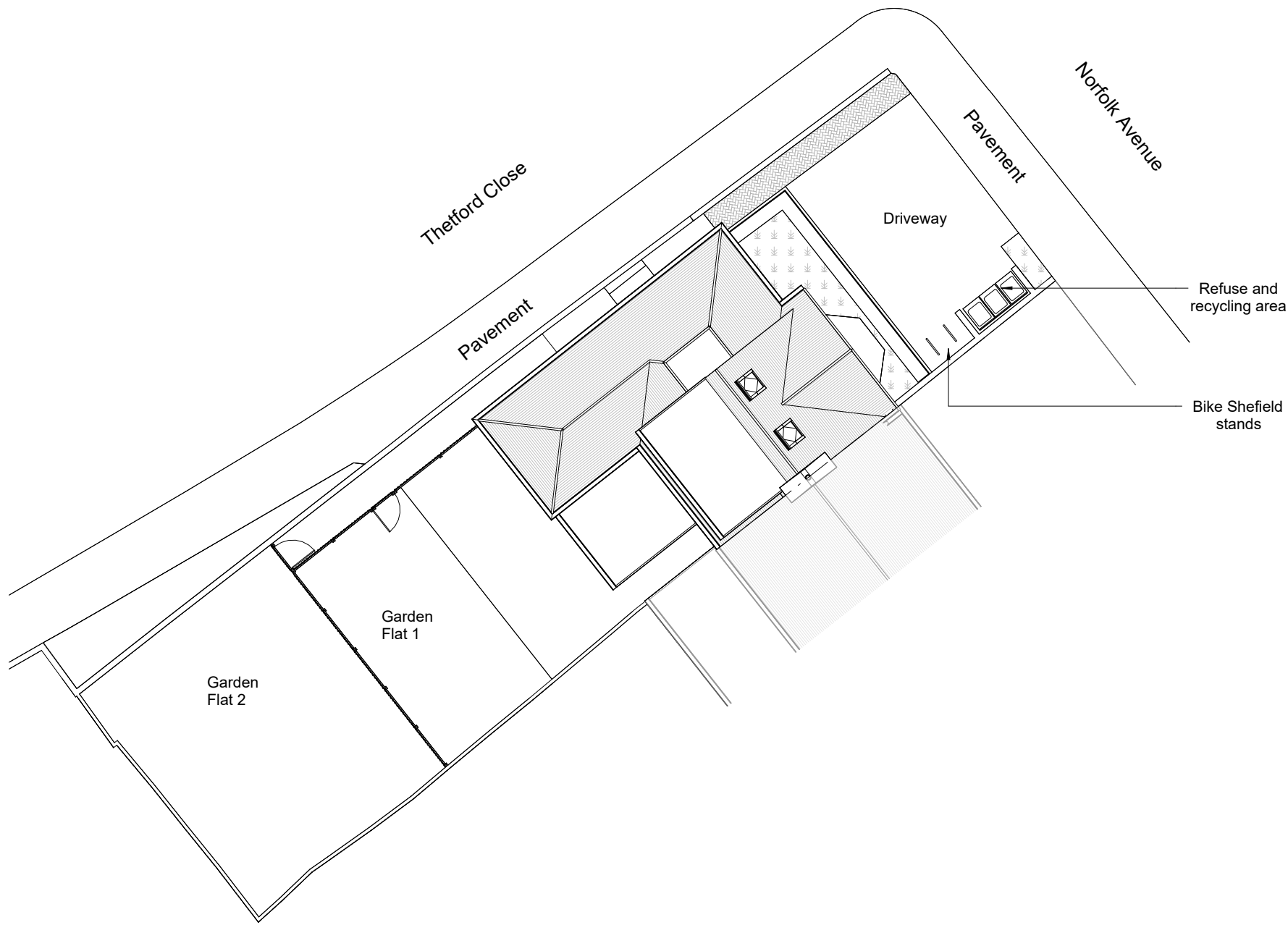
Appendix C- Floor plan and elevations used to produce SAP Calculation for this development.

Appendix D- SAP 2021 calculation reports for the selected units that were used to base the calculations on for this report.

Appendix E- Example water calculation

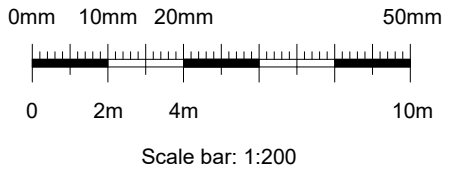


Site Plan as Existing
1 : 200



Site Plan as Proposed
1 : 200

Issue: Planning



No scaled dimensions to be taken from this drawings. All dimensions to be site checked.

Revisions			
Rev.	Description	Date	By

CG ARCHITECTS

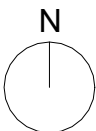
36 CANNON HILL, LONDON N14 6LG
T. 020 8449 5100

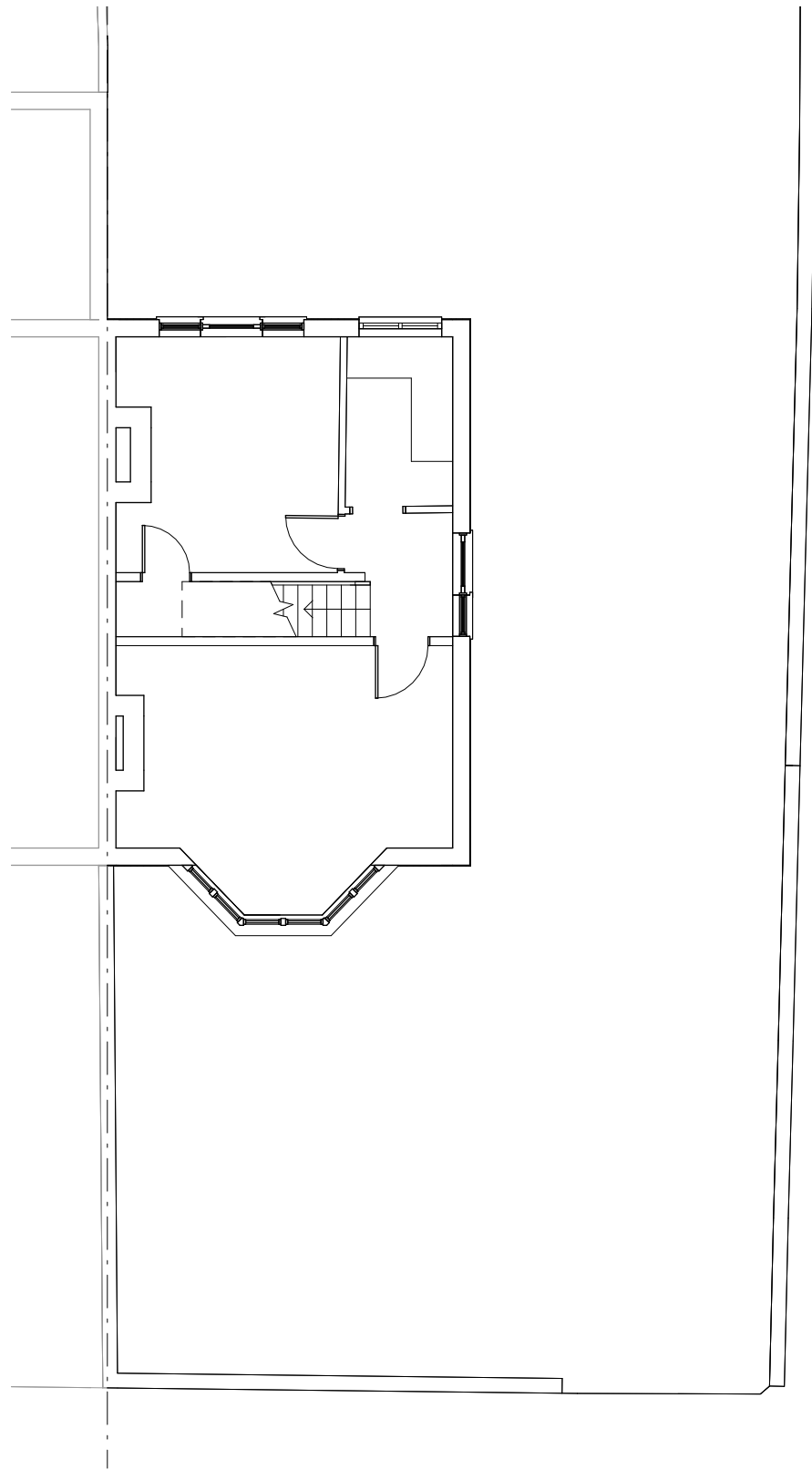
Client:
Mr. Steven Antoniou

Site:
116 Norfolk Avenue
London, N13 6AJ

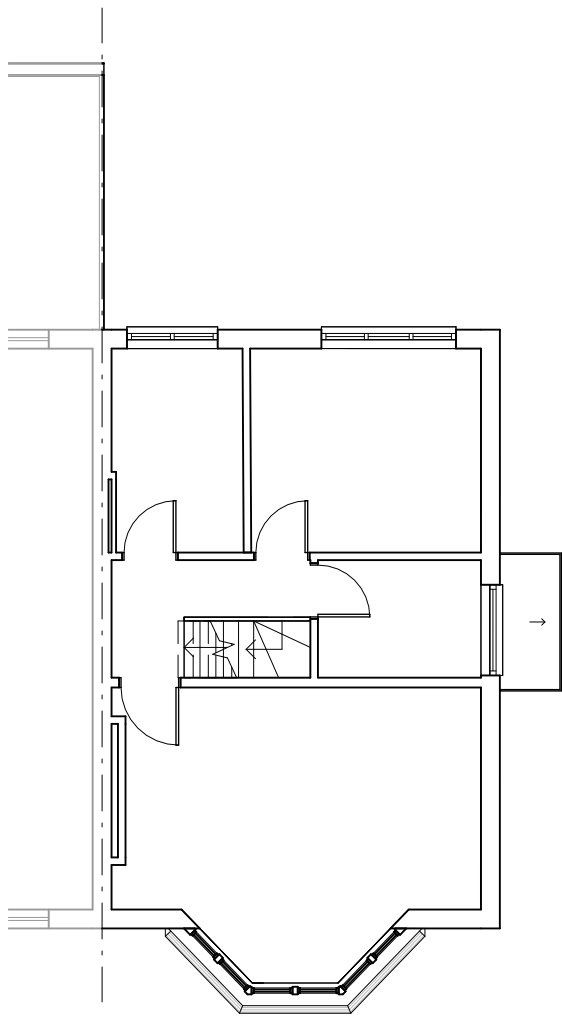
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Site Plan as Existing and as Proposed

Scale: 1 : 200(@ A2)	Drawn: -	Checked: CG
Date: April 2023		
Drg No 1653/02	REV	



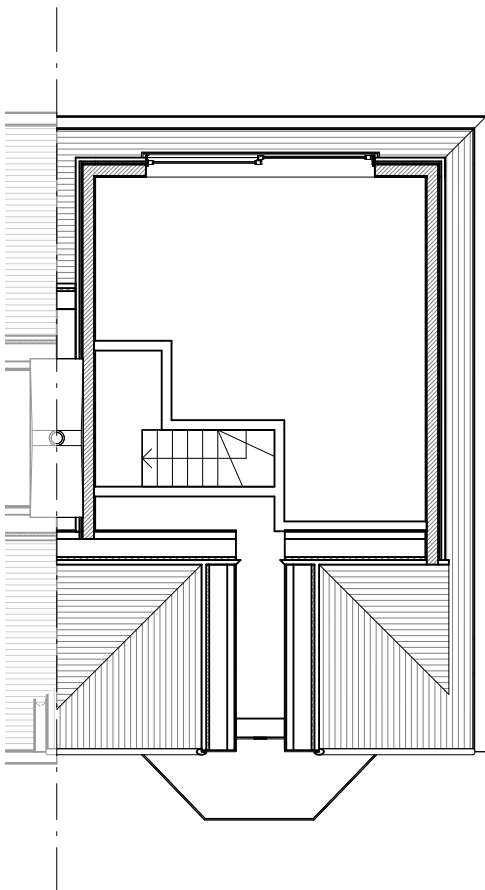


Ground Floor Plan as Existing
1 : 100

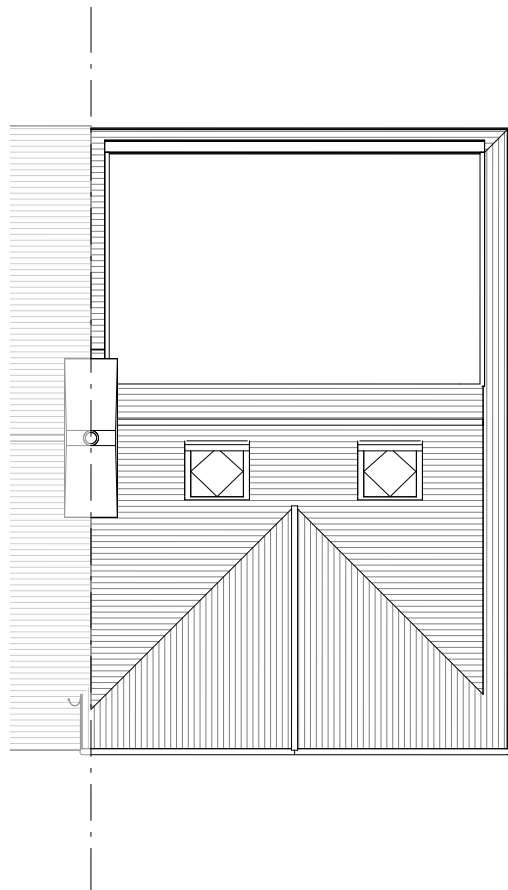


First Floor Plan as Existing
1 : 100

ROOF EXTENSION INVOLVING HIP TO GABLE, REAR DORMER WINDOW WITH JULIETTE BALCONY AND FRONT FACING ROOFLIGHTS: APPROVED UNDER PERMITTED DEVELOPMENT
Ref.: HGY/2021/2020

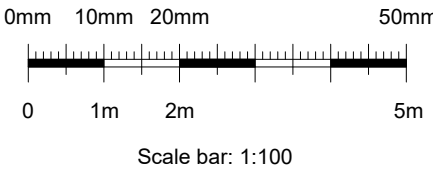


Second Floor Plan as Existing
1 : 100



Roof Plan as Existing
1 : 100

Issue:
Planning



No scaled dimensions to be taken from this drawings. All dimensions to be site checked.

Revisions			
Rev.	Description	Date	By

CG ARCHITECTS

36 CANNON HILL, LONDON N14 6LG
T. 020 8449 5100

Client:
Mr. Steven Antoniou

Site:
116 Norfolk Avenue
London, N13 6AJ

Title:
Floor Plans and Elevations as Existing

Scale: 1 : 100(@ A2)	Drawn: Author	Checked: Checker
Date: April 2023	REV	
Drg No 1653/03		



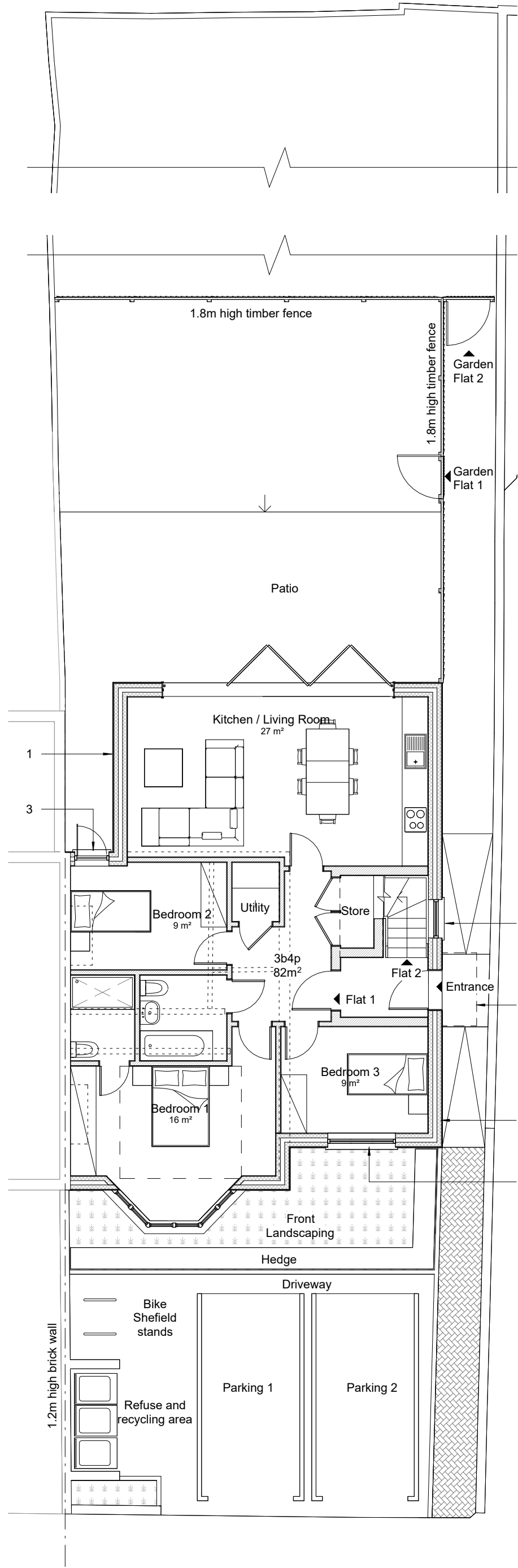
Front (East) Elevation as Existing
1 : 100



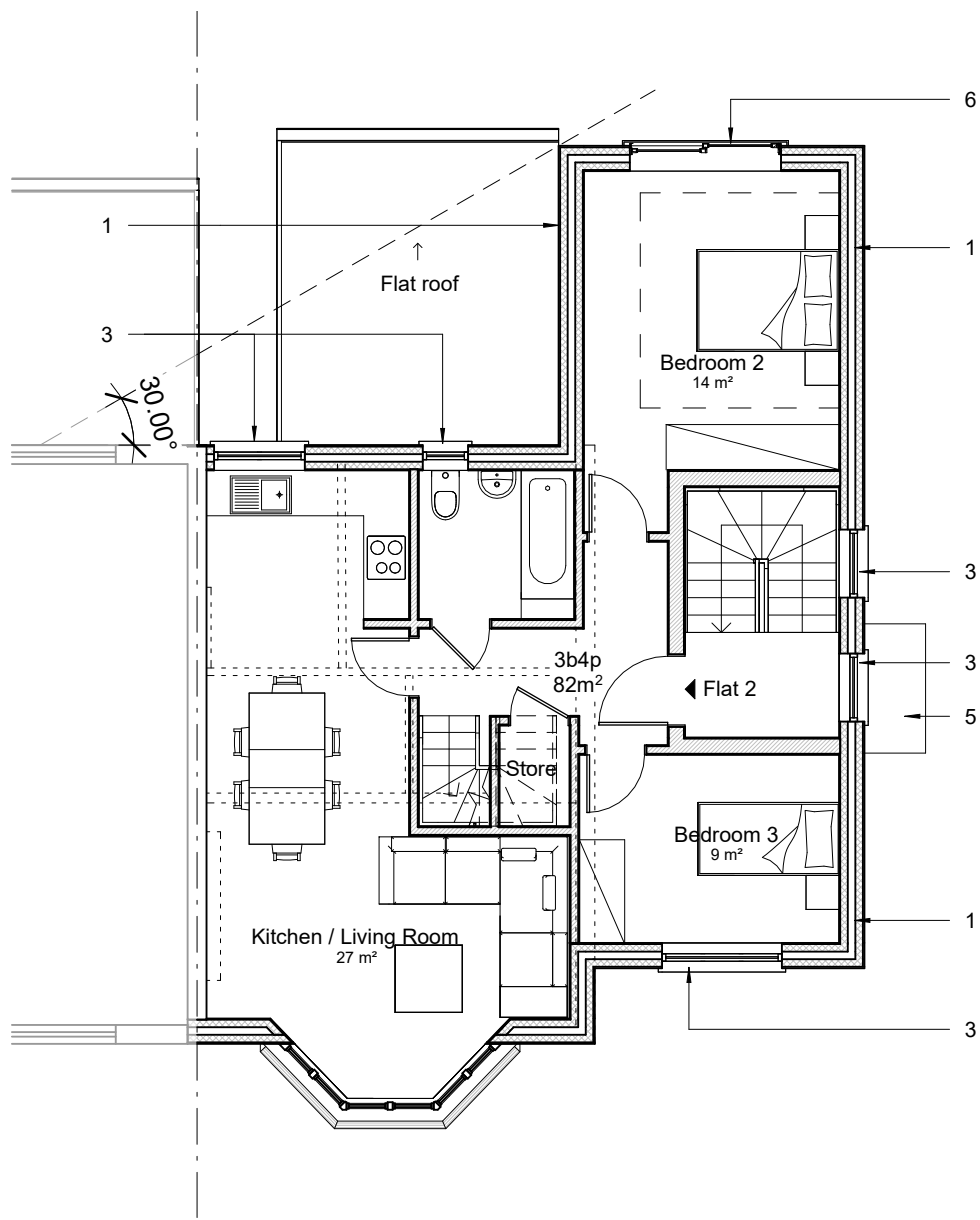
Rear (West) Elevation as Existing
1 : 100



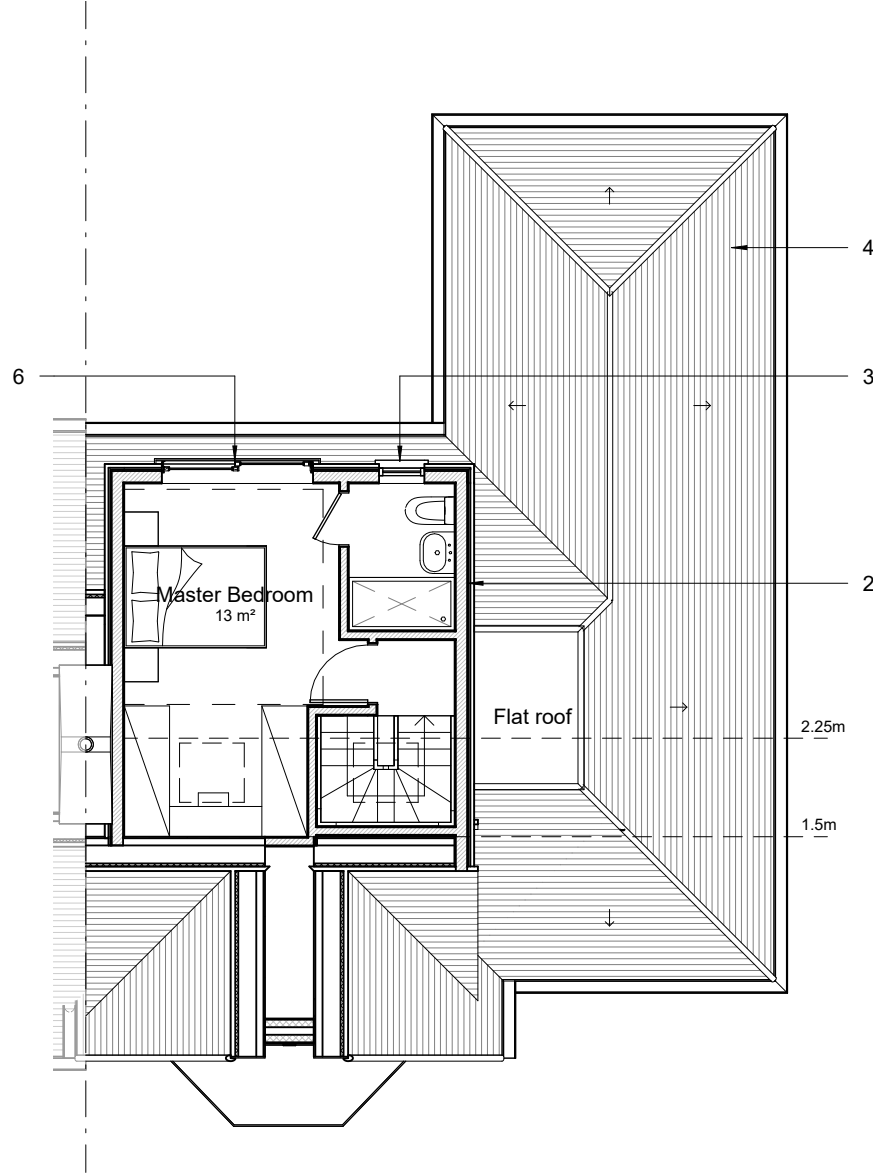
Flank (North) Elevation as Existing
1 : 100



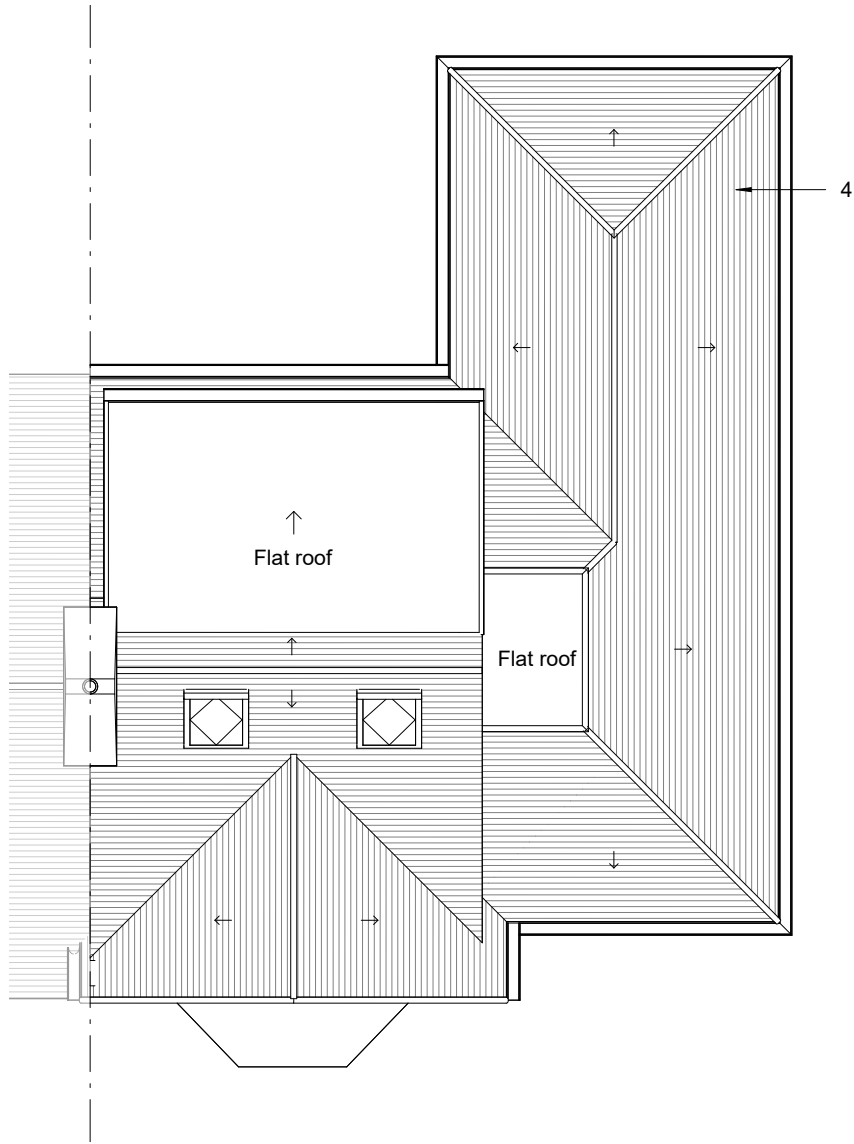
Ground Floor Plan as Proposed
1 : 100



First Floor Plan as Proposed
1 : 100



Second Floor Plan as Proposed
1 : 100



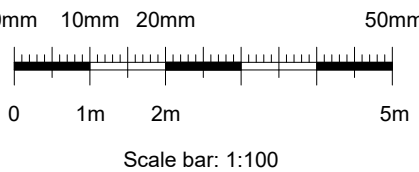
Roof Plan as Proposed
1 : 100

Issue:
Planning

Key

- Existing
- Demolished
- New Wall in Cavity with external render
- Dormer wall with hanging tiles
- Internal Partition

- New Wall in Cavity with external render
- Dormer Wall with hanging tiles
- uPVC frame Double glazed Windows
- Pitched roof with tiles
- CHERWELL Overdoor canopy
- Juliette Balcony



No scaled dimensions to be taken from this drawings. All dimensions to be site checked.

Revisions		
Rev.	Description	By

CG ARCHITECTS

36 CANNON HILL, LONDON N14 6LG
T. 020 8449 5100

Client:
Mr. Steven Antoniou

Site:
116 Norfolk Avenue
London, N13 6AJ

Title:
Floor Plans as Proposed

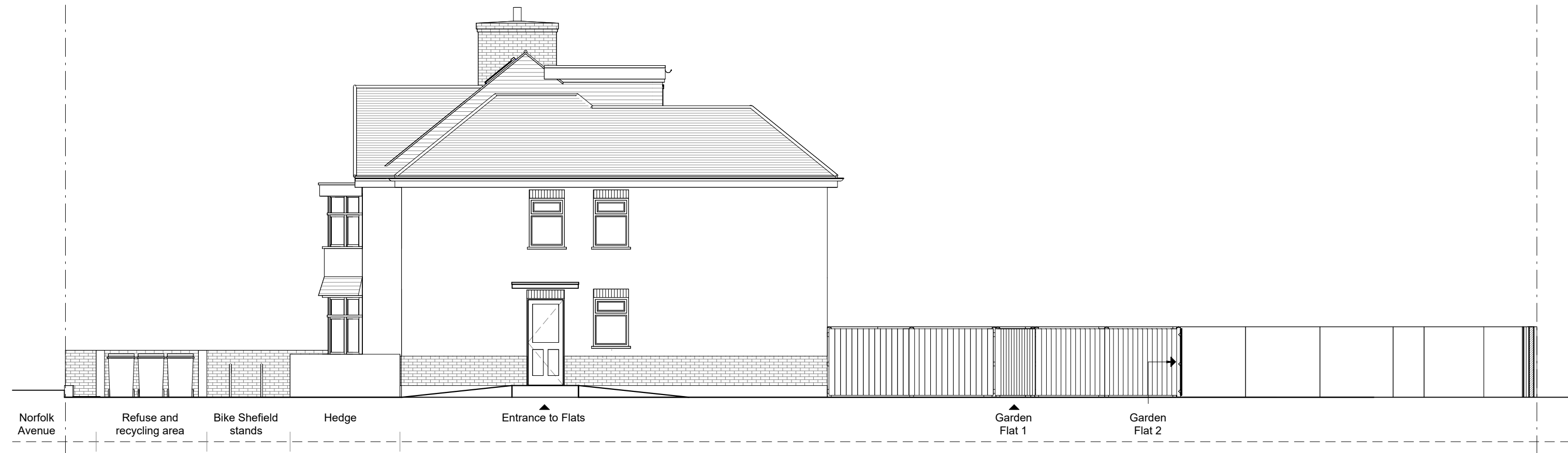
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Date: April 2023	REV	
Drg No 1653/04	REV	



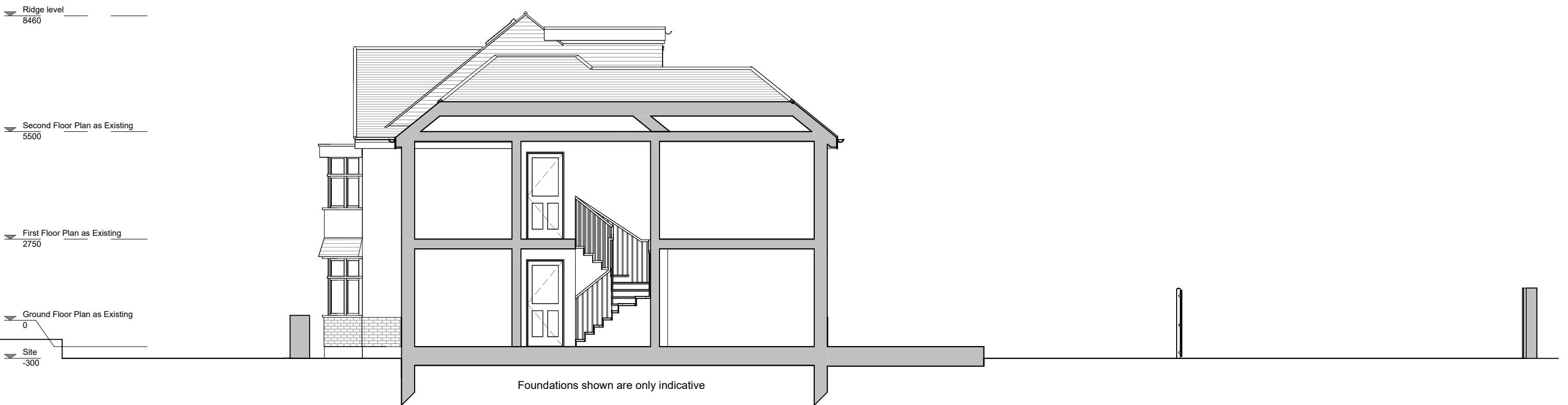
Front (East) Elevation as Proposed
1 : 100



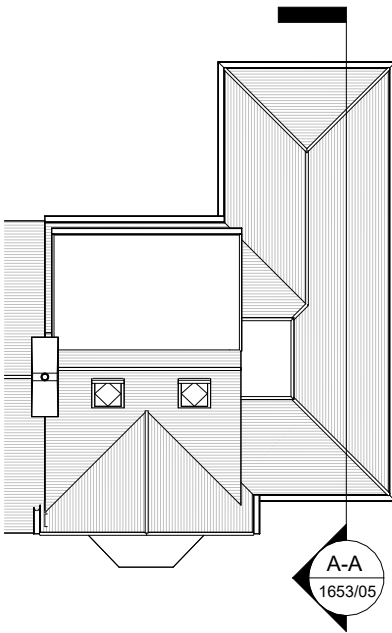
Rear (West) Elevation as Proposed
1 : 100



Flank (North) Elevation as Proposed
1 : 100

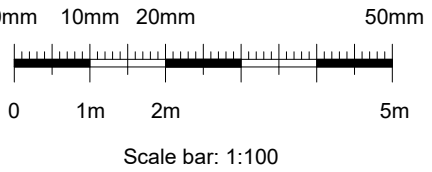


Section A-A as Proposed
1 : 100



Issue: Planning

- Key**
- Existing
 - Demolished
 - New Wall in Cavity with external render
 - Dormer wall with hanging tiles
 - Internal Partition
1. New Wall in Cavity with external render
2. Dormer Wall with hanging tiles
3. uPVC frame Double glazed Windows
4. Pitched roof with tiles
5. CHERWELL Overdoor canopy
6. Juliette Balcony



No scaled dimensions to be taken from this drawings. All dimensions to be site checked.

Revisions			
Rev.	Description	Date	By

CG ARCHITECTS

36 CANNON HILL, LONDON N14 6LG
T. 020 8449 5100

Client:
Mr. Steven Antoniou

Site:
116 Norfolk Avenue
London, N13 6AJ

Title:
Elevations and Sections as Proposed

Scale: As indicated(@ A2)	Drawn: -	Checked: CG
Date: April 2023	REV	
Drg No 1653/05		

Full SAP Calculation Printout



Property Reference	Flat 02-116 Norfolk Avenue				Issued on Date	30/06/2023
Assessment Reference	001-Baseline		Prop Type Ref	PR10687		
Property	116, Norfolk Avenue, London, N13 6AJ					
SAP Rating	73 C	DER		TER		
Environmental	73 C	% DER < TER				N/A
CO ₂ Emissions (t/year)	2.18	DFEE		TFEE		
Compliance Check	See BREL	% DFEE < TFEE				
% DPER < TPER		DPER		TPER		
Assessor Details	Mr. Nikolas Koutsorizof				Assessor ID	U127-0001
Client	- Chris Georgiou					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	64.1700 (1b)	x 2.5000 (2b)	= 160.4250 (1b) -
First floor	20.1500 (1c)	x 2.3600 (2c)	= 47.5540 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.3200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	207.9790 (5)

2. Ventilation rate

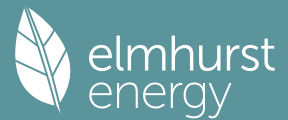
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 30.0000 / (5) = 0.1442 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8942 (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) = 0.7601 (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	0.9691	0.9501	0.9311	0.8361	0.8171	0.7221	0.7221	0.7031	0.7601	0.8171	0.8551	0.8931 (22b)
Effective ac	0.9696	0.9514	0.9335	0.8495	0.8338	0.7607	0.7607	0.7472	0.7889	0.8338	0.8656	0.8988 (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
New Windows (Uw = 1.60)			10.8300	1.5038	16.2857		(27)
Exist. Windows (Uw = 2.10)			6.2100	1.9373	12.0304		(27)
New D to Corridor			2.0200	1.4000	2.8280		(26)
Opening 9			0.8500	2.8369	2.4113		(27a)
New Unh.W	20.7800	2.0200	18.7600	0.2300	4.3148	190.0000	3564.4000 (29a)
NEW EW	43.4000	6.0900	37.3100	0.2800	10.4468	110.0000	4104.1000 (29a)
Exist.Ext.W-TO BE IMPRO.	29.0800	6.2100	22.8700	0.5500	12.5785	190.0000	4345.3000 (29a)

Full SAP Calculation Printout



New Timb. Wall	1.1400		1.1400	0.2800	0.3192	9.0000	10.2600 (29a)
Per. Solid W-TO BE IMPRO.	11.4500		11.4500	0.2600	2.9770	190.0000	2175.5000 (29a)
EW Solid-TO BE IMPRO.	27.6700	4.7400	22.9300	0.3000	6.8790	190.0000	4356.7000 (29a)
New Flat R	3.2900		3.2900	0.1800	0.5922	9.0000	29.6100 (30)
New Rins@Joists	40.7300		40.7300	0.1600	6.5168	9.0000	366.5700 (30)
Exist. Flat R-TO BE IMPRO.	14.7300		14.7300	0.1800	2.6514	9.0000	132.5700 (30)
Exist.Rins.@Raft.-TO BE IMPRO.	6.5300	0.8500	5.6800	0.1800	1.0224	9.0000	51.1200 (30)
Total net area of external elements Aum(A, m2)			198.8000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	81.8536			(33)
Party Wall 1			18.1300	0.0000	0.0000	180.0000	3263.4000 (32)
Party Floor 1			64.1700			40.0000	2566.8000 (32d)
Internal Wall 1			105.4500			100.0000	10545.0000 (32c)
Internal Floor 1			20.1500			18.0000	362.7000 (32d)
Internal Ceiling 1			20.1500			9.0000	181.3500 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	36055.3800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		427.6018 (35)
Thermal bridges (Default value 0.200 * total exposed area)		39.7600 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	121.6136 (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	(38)
Heat transfer coeff	66.5476	65.2961	64.0693	58.3071	57.2290	52.2103	52.2103	51.2809	54.1434	57.2290	59.4099	61.6900	(39)
Average = Sum(39)m / 12 =	188.1612	186.9097	185.6829	179.9207	178.8426	173.8239	173.8239	172.8945	175.7570	178.8426	181.0236	183.3036	(39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(40)
HLP (average)	2.2315	2.2167	2.2021	2.1338	2.1210	2.0615	2.0615	2.0505	2.0844	2.1210	2.1469	2.1739	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

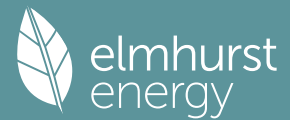
Assumed occupancy													2.5397 (42)
Hot water usage for mixer showers	91.8538	90.4735	88.4620	84.6133	81.7731	78.6058	76.8055	78.8017	80.9900	84.3908	88.3221	91.5019	(42a)
Hot water usage for baths	28.8506	28.4221	27.8188	26.7062	25.8732	24.9495	24.4505	25.0497	25.7021	26.6905	27.8259	28.7531	(42b)
Hot water usage for other uses	40.6395	39.1617	37.6839	36.2061	34.7283	33.2505	33.2505	34.7283	36.2061	37.6839	39.1617	40.6395	(42c)
Average daily hot water use (litres/day)													148.3802 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	161.3439	158.0573	153.9646	147.5256	142.3746	136.8058	134.5065	138.5797	142.8982	148.7651	155.3097	160.8944	(44)
Energy content (annual)	255.5293	225.0714	236.6378	201.9552	191.6636	168.2186	162.6739	171.5906	176.2077	201.8729	221.2671	251.9218	(45)
Distribution loss (46)m = 0.15 x (45)m													Total = Sum(45)m = 2464.6101
Water storage loss:	38.3294	33.7607	35.4957	30.2933	28.7495	25.2328	24.4011	25.7386	26.4312	30.2809	33.1901	37.7883	(46)
Store volume													210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.3600 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.7344 (55)
Total storage loss	22.7664	20.5632	22.7664	22.0320	22.7664	22.0320	22.7664	22.7664	22.0320	22.7664	22.0320	22.7664	(56)
If cylinder contains dedicated solar storage	22.7664	20.5632	22.7664	22.0320	22.7664	22.0320	22.7664	22.7664	22.0320	22.7664	22.0320	22.7664	(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	301.5581	266.6458	282.6666	246.4992	237.6924	212.7626	208.7027	217.6194	220.7517	247.9017	265.8111	297.9506	(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	301.5581	266.6458	282.6666	246.4992	237.6924	212.7626	208.7027	217.6194	220.7517	247.9017	265.8111	297.9506	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month	121.7865	108.0958	115.5051	102.7853	100.5512	91.5679	90.9121	93.8769	94.2243	103.9458	109.2065	120.5870	(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	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	38.7113	34.3831	27.9622	21.1692	15.8242	13.3595	14.4354	18.7636	25.1845	31.9775	37.3225	39.7873	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	340.6449	344.1797	335.2721	316.3087	292.3709	269.8728	254.8426	251.3078	260.2154	279.1788	303.1166	325.6147	(69)
	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	(69)

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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)	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895 (71)
Water heating gains (Table 5)	163.6916	160.8568	155.2488	142.7574	135.1494	127.1776	122.1937	126.1787	130.8670	139.7121	151.6757	162.0794 (72)
Total internal gains	649.6208	645.9925	625.0560	586.8082	549.9175	513.9828	495.0446	499.8230	519.8399	557.4413	598.6877	634.0543 (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
Northeast	2.0500	11.2829	0.6300	0.7000	0.7700	7.0688 (75)
Southwest	8.7800	36.7938	0.6300	0.7000	0.7700	98.7282 (79)
North	1.3300	10.6334	0.6300	0.7000	0.7700	4.3221 (74)
Northeast	1.4600	11.2829	0.6300	0.7000	0.7700	5.0344 (75)
East	1.3300	19.6403	0.6300	0.7000	0.7700	7.9831 (76)
Southwest	2.0900	36.7938	0.6300	0.7000	0.7700	23.5014 (79)
Northeast	0.8500	16.8560	0.7600	0.7000	1.0000	6.8601 (82)

Solar gains	153.4981	270.9425	395.4277	530.6177	630.9030	642.2787	612.6033	535.4462	441.9273	306.1571	185.5927	130.2321 (83)
Total gains	803.1188	916.9350	1020.4838	1117.4259	1180.8205	1156.2615	1107.6479	1035.2693	961.7673	863.5984	784.2804	764.2864 (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, n _l ,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	53.2277	53.5841	53.9381	55.6655	56.0011	57.6180	57.6180	57.9277	56.9843	56.0011	55.3264	54.6382
alpha	4.5485	4.5723	4.5959	4.7110	4.7334	4.8412	4.8412	4.8618	4.7990	4.7334	4.6884	4.6425
util living area	0.9985	0.9970	0.9928	0.9785	0.9333	0.8124	0.6503	0.7054	0.9080	0.9856	0.9971	0.9988 (86)
MIT	19.3081	19.4831	19.7823	20.2086	20.5896	20.8726	20.9672	20.9521	20.7508	20.2623	19.7352	19.3156 (87)
Th 2	19.1835	19.1928	19.2020	19.2456	19.2539	19.2927	19.2927	19.2999	19.2777	19.2539	19.2372	19.2199 (88)
util rest of house	0.9976	0.9950	0.9878	0.9618	0.8762	0.6613	0.4188	0.4768	0.8039	0.9710	0.9948	0.9981 (89)
MIT 2	17.7381	17.9192	18.2227	18.6711	19.0225	19.2551	19.2896	19.2942	19.1772	18.7353	18.2039	17.7724 (90)
Living area fraction	f _{LA} = Living area / (4) =											0.3178 (91)
MIT	18.2371	18.4162	18.7184	19.1598	19.5206	19.7692	19.8228	19.8212	19.6774	19.2207	18.6906	18.2629 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.0871	18.2662	18.5684	19.0098	19.3706	19.6192	19.6728	19.6712	19.5274	19.0707	18.5406	18.1129 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9967	0.9935	0.9852	0.9586	0.8813	0.6959	0.4748	0.5328	0.8241	0.9687	0.9934	0.9974 (94)
Useful gains	800.4376	910.9779	1005.3404	1071.1554	1040.6127	804.5865	525.9125	551.5879	792.6276	836.5545	779.1240	762.2937 (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	2594.2005	2498.2810	2240.8980	1818.9641	1371.8339	872.4604	534.1250	565.5647	953.8950	1514.9158	2071.0161	2550.2852 (97)
Space heating kWh	1334.5596	1066.6677	919.2549	538.4222	246.4286	0.0000	0.0000	0.0000	0.0000	504.7008	930.1623	1330.2657 (98a)
Space heating requirement - total per year (kWh/year)												6870.4617
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	1334.5596	1066.6677	919.2549	538.4222	246.4286	0.0000	0.0000	0.0000	0.0000	504.7008	930.1623	1330.2657 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6870.4617
Space heating per m2												(98c) / (4) = 81.4808 (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 %)												84.0000 (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
	1334.5596	1066.6677	919.2549	538.4222	246.4286	0.0000	0.0000	0.0000	0.0000	504.7008	930.1623	1330.2657 (98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000 (210)
Space heating fuel (main heating system)	1588.7614	1269.8425	1094.3511	640.9789	293.3673	0.0000	0.0000	0.0000	0.0000	600.8343	1107.3361	1583.6496 (211)
Space heating efficiency (main heating system 2)												

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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)
	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	301.5581	266.6458	282.6666	246.4992	237.6924	212.7626	208.7027	217.6194	220.7517	247.9017	265.8111	297.9506	(64)
Efficiency of water heater	81.9586	81.7896	81.4126	80.5803	78.7735	74.0000	74.0000	74.0000	74.0000	80.4203	81.5507	74.0000	(216)
Fuel for water heating, kWh/month	367.9394	326.0143	347.2024	305.9050	301.7415	287.5171	282.0307	294.0803	298.3131	308.2576	325.9459	363.4745	(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	33.8838	27.1829	24.4751	17.9315	13.8508	11.3163	12.6352	16.4237	21.3328	27.9898	31.6144	34.8256	(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												8179.1211	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												74.0000	
Water heating fuel used												3808.4219	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												273.4618	(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												12347.0048	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	8179.1211	3.6400	297.7200 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3808.4219	3.6400	138.6266 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814 (249)
Energy for lighting	273.4618	16.4900	45.0939 (250)
Additional standing charges			92.0000 (251)
Total energy cost			587.6218 (255)

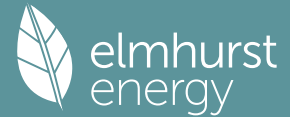
11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.6358 (257)
SAP value		73.4834
SAP rating (Section 12)		73 (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	8179.1211	0.2100	1717.6154 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3808.4219	0.2100	799.7686 (264)

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Space and water heating			2517.3840 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	273.4618	0.1443	39.4690 (268)
Total CO2, kg/year			2568.7823 (272)
CO2 emissions per m2			30.4600 (273)
EI value			73.3826
EI rating			73 (274)
EI band			C

SAP 10 WORKSHEET FOR Conversion (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)
Ground floor	64.1700 (1b)	x 2.5000 (2b)	= 160.4250 (1b) -
First floor	20.1500 (1c)	x 2.3600 (2c)	= 47.5540 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.3200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	207.9790 (5)

2. Ventilation rate

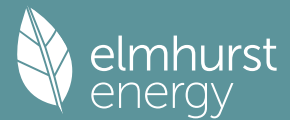
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 30.0000 / (5) = 0.1442 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8942 (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) = 0.7601 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.1000	3.7000	3.8000	3.2000	3.4000	3.7000	3.5000	3.7000	3.6000	4.0000 (22)
Wind factor	1.0500	1.0000	1.0250	0.9250	0.9500	0.8000	0.8500	0.9250	0.8750	0.9250	0.9000	1.0000 (22a)
Adj infilt rate	0.7981	0.7601	0.7791	0.7031	0.7221	0.6081	0.6461	0.7031	0.6651	0.7031	0.6841	0.7601 (22b)
Effective ac	0.8185	0.7889	0.8035	0.7472	0.7607	0.6849	0.7087	0.7472	0.7212	0.7472	0.7340	0.7889 (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
New Windows (Uw = 1.60)			10.8300	1.5038	16.2857		(27)
Exist. Windows (Uw = 2.10)			6.2100	1.9373	12.0304		(27)
New D to Corridor			2.0200	1.4000	2.8280		(26)
Opening 9			0.8500	2.8369	2.4113		(27a)
New Unh.W	20.7800	2.0200	18.7600	0.2300	4.3148	190.0000	3564.4000 (29a)
NEW EW	43.4000	6.0900	37.3100	0.2800	10.4468	110.0000	4104.1000 (29a)
Exist.Ext.W-TO BE IMPRO.	29.0800	6.2100	22.8700	0.5500	12.5785	190.0000	4345.3000 (29a)
New Timb. Wall	1.1400		1.1400	0.2800	0.3192	9.0000	10.2600 (29a)
Per. Solid W-TO BE IMPRO.	11.4500		11.4500	0.2600	2.9770	190.0000	2175.5000 (29a)
EW Solid-TO BE IMPRO.	27.6700	4.7400	22.9300	0.3000	6.8790	190.0000	4356.7000 (29a)
New Flat R	3.2900		3.2900	0.1800	0.5922	9.0000	29.6100 (30)
New Rins@Joists	40.7300		40.7300	0.1600	6.5168	9.0000	366.5700 (30)
Exist. Flat R-TO BE IMPRO.	14.7300		14.7300	0.1800	2.6514	9.0000	132.5700 (30)
Exist.Rins.@Raft.-TO BE IMPRO.	6.5300	0.8500	5.6800	0.1800	1.0224	9.0000	51.1200 (30)
Total net area of external elements Aum(A, m2)			198.8000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		81.8536		(33)
Party Wall 1			18.1300	0.0000	0.0000	180.0000	3263.4000 (32)

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Party Floor 1	64.1700	40.0000	2566.8000 (32d)
Internal Wall 1	105.4500	100.0000	10545.0000 (32c)
Internal Floor 1	20.1500	18.0000	362.7000 (32d)
Internal Ceiling 1	20.1500	9.0000	181.3500 (32e)

Heat capacity $C_m = \text{Sum}(A \times k)$ (28)...(30) + (32) + (32a)...(32e) = 36055.3800 (34)
 Thermal mass parameter (TMP = C_m / TFA) in kJ/m2K 427.6018 (35)
 Thermal bridges (Default value 0.200 * total exposed area) 39.7600 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 121.6136 (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	56.1757	54.1434	55.1472	51.2809	52.2103	47.0057	48.6415	51.2809	49.4965	51.2809	50.3763	54.1434	(38)
Heat transfer coeff	177.7893	175.7570	176.7608	172.8945	173.8239	168.6194	170.2551	172.8945	171.1101	172.8945	171.9899	175.7570	(39)
Average = $\text{Sum}(39)m / 12 =$												173.3788	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	2.1085	2.0844	2.0963	2.0505	2.0615	1.9998	2.0192	2.0505	2.0293	2.0505	2.0397	2.0844	(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													2.5397 (42)
Hot water usage for mixer showers	91.8538	90.4735	88.4620	84.6133	81.7731	78.6058	76.8055	78.8017	80.9900	84.3908	88.3221	91.5019	(42a)
Hot water usage for baths	28.8506	28.4221	27.8188	26.7062	25.8732	24.9495	24.4505	25.0497	25.7021	26.6905	27.8259	28.7531	(42b)
Hot water usage for other uses	40.6395	39.1617	37.6839	36.2061	34.7283	33.2505	33.2505	34.7283	36.2061	37.6839	39.1617	40.6395	(42c)
Average daily hot water use (litres/day)												148.3802	(43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	161.3439	158.0573	153.9646	147.5256	142.3746	136.8058	134.5065	138.5797	142.8982	148.7651	155.3097	160.8944	(44)
Energy content (annual)	255.5293	225.0714	236.6378	201.9552	191.6636	168.2186	162.6739	171.5906	176.2077	201.8729	221.2671	251.9218	(45)
Distribution loss (46)m = 0.15 x (45)m												2464.6101	
	38.3294	33.7607	35.4957	30.2933	28.7495	25.2328	24.4011	25.7386	26.4312	30.2809	33.1901	37.7883	(46)

Water storage loss:
 Store volume 210.0000 (47)
 a) If manufacturer declared loss factor is known (kWh/day):
 Temperature factor from Table 2b 1.3600 (48)
 Enter (49) or (54) in (55) 0.5400 (49)
 Total storage loss 0.7344 (55)

If cylinder contains dedicated solar storage	22.7664	20.5632	22.7664	22.0320	22.7664	22.0320	22.7664	22.7664	22.0320	22.7664	22.0320	22.7664	(56)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Total heat required for water heating calculated for each month	301.5581	266.6458	282.6666	246.4992	237.6924	212.7626	208.7027	217.6194	220.7517	247.9017	265.8111	297.9506	(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	301.5581	266.6458	282.6666	246.4992	237.6924	212.7626	208.7027	217.6194	220.7517	247.9017	265.8111	297.9506	(64)
Total per year (kWh/year) = $\text{Sum}(64)m =$												3006.5621	(64)

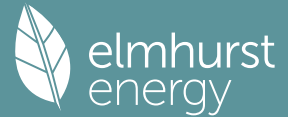
Electric shower(s)
 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)
 Total Energy used by instantaneous electric shower(s) (kWh/year) = $\text{Sum}(64a)m =$ 0.0000 (64a)

Heat gains from water heating, kWh/month	121.7865	108.0958	115.5051	102.7853	100.5512	91.5679	90.9121	93.8769	94.2243	103.9458	109.2065	120.5870	(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	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	38.7113	34.3831	27.9622	21.1692	15.8242	13.3595	14.4354	18.7636	25.1845	31.9775	37.3225	39.7873	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.6449	344.1797	335.2721	316.3087	292.3709	269.8728	254.8426	251.3078	260.2154	279.1788	303.1166	325.6147	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	(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)	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	(71)
Water heating gains (Table 5)	163.6916	160.8568	155.2488	142.7574	135.1494	127.1776	122.1937	126.1787	130.8670	139.7121	151.6757	162.0794	(72)
Total internal gains	649.6208	645.9925	625.0560	586.8082	549.9175	513.9828	495.0446	499.8230	519.8399	557.4413	598.6877	634.0543	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
Northeast	2.0500	12.9236	0.6300	0.7000	0.7700	0.7700	8.0967 (75)
Southwest	8.7800	40.4699	0.6300	0.7000	0.7700	0.7700	108.5922 (79)
North	1.3300	11.9814	0.6300	0.7000	0.7700	0.7700	4.8700 (74)
Northeast	1.4600	12.9236	0.6300	0.7000	0.7700	0.7700	5.7664 (75)
East	1.3300	22.3313	0.6300	0.7000	0.7700	0.7700	9.0769 (76)
Southwest	2.0900	40.4699	0.6300	0.7000	0.7700	0.7700	25.8494 (79)
Northeast	0.8500	19.3863	0.7600	0.7000	1.0000	1.0000	7.8898 (82)
Solar gains	170.1415	261.1023	388.0205	538.1371	623.9869	684.9564	658.3356
Total gains	819.7622	907.0948	1013.0766	1124.9453	1173.9044	1198.9392	1153.3803
							584.4655
							479.6832
							999.5231
							327.1355
							210.8514
							809.5391
							142.9023 (83)
							776.9566 (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	56.3329	56.9843	56.6607	57.9277	57.6180	59.3964	58.8258	57.9277	58.5318	57.9277	58.2324	56.9843
alpha	4.7555	4.7990	4.7774	4.8618	4.8412	4.9598	4.9217	4.8618	4.9021	4.8618	4.8822	4.7990
util living area	0.9978	0.9962	0.9891	0.9618	0.8692	0.6072	0.3673	0.4264	0.7878	0.9700	0.9949	0.9983 (86)
MIT	19.5811	19.7151	20.0369	20.4469	20.7915	20.9772	20.9985	20.9967	20.9118	20.4985	19.9957	19.5566 (87)
Th 2	19.2620	19.2777	19.2699	19.2999	19.2927	19.3335	19.3206	19.2999	19.3139	19.2999	19.3070	19.2777 (88)
util rest of house	0.9963	0.9936	0.9808	0.9302	0.7597	0.3960	0.1211	0.1594	0.5949	0.9365	0.9905	0.9972 (89)
MIT 2	18.0684	18.2133	18.5249	18.9372	19.2079	19.3313	19.3206	19.2999	19.2963	18.9931	18.5148	18.0559 (90)
Living area fraction	18.5492	18.6906	19.0055	19.4171	19.7113	19.8544	19.8539	19.8392	19.8098	19.4716	18.9855	18.5329 (91)
MIT	18.3992	18.5406	18.8555	19.2671	19.5613	19.7044	19.7039	19.6892	19.6598	19.3216	18.8355	18.3829 (93)
Temperature adjustment												-0.1500
adjusted MIT												18.3829 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9952	0.9919	0.9779	0.9294	0.7811	0.4459	0.1777	0.2214	0.6418	0.9371	0.9886	0.9962 (94)
Useful gains	815.7987	899.7624	990.6792	1045.5090	916.9713	534.5755	204.9361	240.0636	641.4652	828.9223	800.3417	774.0385 (95)
Ext temp.	5.5000	5.9000	7.9000	10.4000	13.5000	16.5000	18.5000	18.3000	15.7000	12.1000	8.4000	5.4000 (96)
Heat loss rate W	2293.3405	2221.6766	1936.5006	1533.0676	1053.5911	540.3230	204.9703	240.1864	677.5557	1248.5690	1794.7992	2281.8310 (97)
Space heating kWh	1099.2911	888.3263	703.6912	351.0422	101.6451	0.0000	0.0000	0.0000	0.0000	312.2172	716.0094	1121.7976 (98a)
Space heating requirement - total per year (kWh/year)												5294.0201
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	1099.2911	888.3263	703.6912	351.0422	101.6451	0.0000	0.0000	0.0000	0.0000	312.2172	716.0094	1121.7976 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5294.0201
Space heating per m2										(98c) / (4) =		62.7849 (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 %)												84.0000 (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	1099.2911	888.3263	703.6912	351.0422	101.6451	0.0000	0.0000	0.0000	0.0000	312.2172	716.0094	1121.7976 (98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000 (210)
Space heating fuel (main heating system)	1308.6799	1057.5313	837.7276	417.9074	121.0061	0.0000	0.0000	0.0000	0.0000	371.6871	852.3922	1335.4733 (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	301.5581	266.6458	282.6666	246.4992	237.6924	212.7626	208.7027	217.6194	220.7517	247.9017	265.8111	297.9506 (64)
Efficiency of water heater												74.0000 (216)

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(217)m	81.6255	81.4586	80.8683	79.5646	76.7364	74.0000	74.0000	74.0000	74.0000	79.2596	81.0353	81.6835	(217)
Fuel for water heating, kWh/month	369.4411	327.3390											
			349.5397	309.8103	309.7519	287.5171	282.0307	294.0803	298.3131	312.7720	328.0190	364.7624	(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	33.8838	27.1829	24.4751	17.9315	13.8508	11.3163	12.6352	16.4237	21.3328	27.9898	31.6144	34.8256	(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												6302.4049	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												74.0000	
Water heating fuel used												3833.3765	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												273.4618	(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												10495.2432	(238)

10a. Fuel costs - using BEDF prices (521)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	6302.4049	3.5000	220.5842	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3833.3765	3.5000	134.1682	(247)
Energy for instantaneous electric shower(s)	0.0000	18.3900	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	18.3900	15.8154	(249)
Energy for lighting	273.4618	18.3900	50.2896	(250)
Additional standing charges			94.0000	(251)
Total energy cost			514.8574	(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	6302.4049	0.2100	1323.5050	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3833.3765	0.2100	805.0091	(264)
Space and water heating			2128.5141	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	273.4618	0.1443	39.4690	(268)
Total CO2, kg/year			2179.9123	(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	6302.4049	1.1300	7121.7175	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3833.3765	1.1300	4331.7155	(278)
Space and water heating			11453.4330	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	273.4618	1.5338	419.4449	(282)
Total Primary energy kWh/year			12002.9786	(286)

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SAP 10 EPC IMPROVEMENTS

001-Baseline

Current energy efficiency rating: C 73
Current environmental impact rating: C 73

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 (none) Typical annual savings Energy Environmental efficiency impact
Total Savings £0 0.00 kg/m²

Potential energy efficiency rating: C 73
Potential environmental impact rating: C 73

Fuel prices for cost data on this page from database revision number 521 TEST (19 Jun 2023)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£66	£66	£0
Mains gas	£449	£449	£0
Space heating	£330	£330	£0
Water heating	£134	£134	£0
Lighting	£50	£50	£0
Total cost of fuels	£515	£515	£0
Total cost of uses	£514	£514	£0
Delivered energy	124 kWh/m²	124 kWh/m²	0 kWh/m²
Carbon dioxide emissions	2.2 tonnes	2.2 tonnes	0.0 tonnes
CO2 emissions per m²	26 kg/m²	26 kg/m²	0 kg/m²
Primary energy	142 kWh/m²	142 kWh/m²	0 kWh/m²

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

1. Overall dwelling characteristics

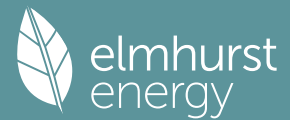
	Area (m²)	Storey height (m)	Volume (m³)
Ground floor	64.1700 (1b)	x 2.5000 (2b)	= 160.4250 (1b) -
First floor	20.1500 (1c)	x 2.3600 (2c)	= 47.5540 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.3200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 207.9790 (5)

2. Ventilation rate

	m³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(7a)+(7b)+(7c) = 30.0000 / (5) = 0.1442 (8)
Pressure test No

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

Blower Door
15.0000 (17)
0.8942 (18)
2 (19)

Shelter factor
Infiltration rate adjusted to include shelter factor

(20) = 1 - [0.075 x (19)] = 0.8500 (20)
(21) = (18) x (20) = 0.7601 (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	0.9691	0.9501	0.9311	0.8361	0.8171	0.7221	0.7221	0.7031	0.7601	0.8171	0.8551	0.8931	(22b)
Effective ac	0.9696	0.9514	0.9335	0.8495	0.8338	0.7607	0.7607	0.7472	0.7889	0.8338	0.8656	0.8988	(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	
New Windows (Uw = 1.60)			10.8300	1.5038	16.2857			(27)
Exist. Windows (Uw = 2.10)			6.2100	1.9373	12.0304			(27)
New D to Corridor			2.0200	1.4000	2.8280			(26)
Opening 9			0.8500	2.8369	2.4113			(27a)
New Unh.W	20.7800	2.0200	18.7600	0.2300	4.3148	190.0000	3564.4000	(29a)
NEW EW	43.4000	6.0900	37.3100	0.2800	10.4468	110.0000	4104.1000	(29a)
Exist.Ext.W-TO BE IMPRO.	29.0800	6.2100	22.8700	0.5500	12.5785	190.0000	4345.3000	(29a)
New Timb. Wall	1.1400		1.1400	0.2800	0.3192	9.0000	10.2600	(29a)
Per. Solid W-TO BE IMPRO.	11.4500		11.4500	0.2600	2.9770	190.0000	2175.5000	(29a)
EW Solid-TO BE IMPRO.	27.6700	4.7400	22.9300	0.3000	6.8790	190.0000	4356.7000	(29a)
New Flat R	3.2900		3.2900	0.1800	0.5922	9.0000	29.6100	(30)
New Rins@Joists	40.7300		40.7300	0.1600	6.5168	9.0000	366.5700	(30)
Exist. Flat R-TO BE IMPRO.	14.7300		14.7300	0.1800	2.6514	9.0000	132.5700	(30)
Exist.Rins.@Raft.-TO BE IMPRO.	6.5300	0.8500	5.6800	0.1800	1.0224	9.0000	51.1200	(30)
Total net area of external elements Aum(A, m2)			198.8000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	81.8536			(33)
Party Wall 1			18.1300	0.0000	0.0000	180.0000	3263.4000	(32)
Party Floor 1			64.1700			40.0000	2566.8000	(32d)
Internal Wall 1			105.4500			100.0000	10545.0000	(32c)
Internal Floor 1			20.1500			18.0000	362.7000	(32d)
Internal Ceiling 1			20.1500			9.0000	181.3500	(32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
Thermal bridges (Default value 0.200 * total exposed area)
Point Thermal bridges
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 36055.3800 (34)
427.6018 (35)
39.7600 (36)
(36a) = 0.0000
(33) + (36) + (36a) = 121.6136 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	66.5476	65.2961	64.0693	58.3071	57.2290	52.2103	52.2103	51.2809	54.1434	57.2290	59.4099	61.6900	(38)
Heat transfer coeff	188.1612	186.9097	185.6829	179.9207	178.8426	173.8239	173.8239	172.8945	175.7570	178.8426	181.0236	183.3036	(39)
Average = Sum(39)m / 12 =												179.9155	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.2315	2.2167	2.2021	2.1338	2.1210	2.0615	2.0615	2.0505	2.0844	2.1210	2.1469	2.1739	(40)
HLP (average)												2.1337	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5397 (42)
Hot water usage for mixer showers													
91.8538	90.4735	88.4620	84.6133	81.7731	78.6058	76.8055	78.8017	80.9900	84.3908	88.3221	91.5019	91.5019	(42a)
Hot water usage for baths													
28.8506	28.4221	27.8188	26.7062	25.8732	24.9495	24.4505	25.0497	25.7021	26.6905	27.8259	28.7531	28.7531	(42b)
Hot water usage for other uses													
40.6395	39.1617	37.6839	36.2061	34.7283	33.2505	33.2505	34.7283	36.2061	37.6839	39.1617	40.6395	40.6395	(42c)
Average daily hot water use (litres/day)													148.3802 (43)
Daily hot water use													
161.3439	158.0573	153.9646	147.5256	142.3746	136.8058	134.5065	138.5797	142.8982	148.7651	155.3097	160.8944	160.8944	(44)
Energy conte	255.5293	225.0714	236.6378	201.9552	191.6636	168.2186	162.6739	171.5906	176.2077	201.8729	221.2671	251.9218	(45)
Energy content (annual)										Total = Sum(45)m =		2464.6101	
Distribution loss (46)m = 0.15 x (45)m													
38.3294	33.7607	35.4957	30.2933	28.7495	25.2328	24.4011	25.7386	26.4312	30.2809	33.1901	37.7883	37.7883	(46)
Water storage loss:													
Store volume													210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.3600 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.7344 (55)
Total storage loss													
22.7664	20.5632	22.7664	22.0320	22.7664	22.0320	22.7664	22.7664	22.0320	22.7664	22.0320	22.7664	22.7664	(56)
If cylinder contains dedicated solar storage													
22.7664	20.5632	22.7664	22.0320	22.7664	22.0320	22.7664	22.7664	22.0320	22.7664	22.0320	22.7664	22.7664	(57)

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Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
	301.5581	266.6458	282.6666	246.4992	237.6924	212.7626	208.7027	217.6194	220.7517	247.9017	265.8111	297.9506 (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	301.5581	266.6458	282.6666	246.4992	237.6924	212.7626	208.7027	217.6194	220.7517	247.9017	265.8111	297.9506 (64)
Total per year (kWh/year) = Sum(64)m =												3006.5621 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
	121.7865	108.0958	115.5051	102.7853	100.5512	91.5679	90.9121	93.8769	94.2243	103.9458	109.2065	120.5870 (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	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	38.7113	34.3831	27.9622	21.1692	15.8242	13.3595	14.4354	18.7636	25.1845	31.9775	37.3225	39.7873 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	340.6449	344.1797	335.2721	316.3087	292.3709	269.8728	254.8426	251.3078	260.2154	279.1788	303.1166	325.6147 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782 (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)												
	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895 (71)
Water heating gains (Table 5)												
	163.6916	160.8568	155.2488	142.7574	135.1494	127.1776	122.1937	126.1787	130.8670	139.7121	151.6757	162.0794 (72)
Total internal gains	649.6208	645.9925	625.0560	586.8082	549.9175	513.9828	495.0446	499.8230	519.8399	557.4413	598.6877	634.0543 (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
Northeast	2.0500	11.2829	0.6300	0.7000	0.7700	7.0688 (75)
Southwest	8.7800	36.7938	0.6300	0.7000	0.7700	98.7282 (79)
North	1.3300	10.6334	0.6300	0.7000	0.7700	4.3221 (74)
Northeast	1.4600	11.2829	0.6300	0.7000	0.7700	5.0344 (75)
East	1.3300	19.6403	0.6300	0.7000	0.7700	7.9831 (76)
Southwest	2.0900	36.7938	0.6300	0.7000	0.7700	23.5014 (79)
Northeast	0.8500	16.8560	0.7600	0.7000	1.0000	6.8601 (82)

Solar gains	153.4981	270.9425	395.4277	530.6177	630.9030	642.2787	612.6033	535.4462	441.9273	306.1571	185.5927	130.2321 (83)
Total gains	803.1188	916.9350	1020.4838	1117.4259	1180.8205	1156.2615	1107.6479	1035.2693	961.7673	863.5984	784.2804	764.2864 (84)

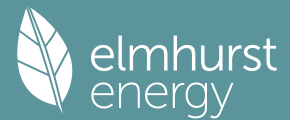
7. Mean internal temperature (heating season)

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	53.2277	53.5841	53.9381	55.6655	56.0011	57.6180	57.6180	57.9277	56.9843	56.0011	55.3264	54.6382
alpha	4.5485	4.5723	4.5959	4.7110	4.7334	4.8412	4.8412	4.8618	4.7990	4.7334	4.6884	4.6425
util living area	0.9985	0.9970	0.9928	0.9785	0.9333	0.8124	0.6503	0.7054	0.9080	0.9856	0.9971	0.9988 (86)
MIT	19.3081	19.4831	19.7823	20.2086	20.5896	20.8726	20.9672	20.9521	20.7508	20.2623	19.7352	19.3156 (87)
Th 2	19.1835	19.1928	19.2020	19.2456	19.2539	19.2927	19.2927	19.2999	19.2777	19.2539	19.2372	19.2199 (88)
util rest of house	0.9976	0.9950	0.9878	0.9618	0.8762	0.6613	0.4188	0.4768	0.8039	0.9710	0.9948	0.9981 (89)
MIT 2	17.7381	17.9192	18.2227	18.6711	19.0225	19.2551	19.2896	19.2942	19.1772	18.7353	18.2039	17.7724 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.2371	18.4162	18.7184	19.1598	19.5206	19.7692	19.8228	19.8212	19.6774	19.2207	18.6906	18.2629 (92)
Temperature adjustment												
adjusted MIT	18.0871	18.2662	18.5684	19.0098	19.3706	19.6192	19.6728	19.6712	19.5274	19.0707	18.5406	18.1129 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9967	0.9935	0.9852	0.9586	0.8813	0.6959	0.4748	0.5328	0.8241	0.9687	0.9934	0.9974 (94)
Useful gains	800.4376	910.9779	1005.3404	1071.1554	1040.6127	804.5865	525.9125	551.5879	792.6276	836.5545	779.1240	762.2937 (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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	2594.2005	2498.2810	2240.8980	1818.9641	1371.8339	872.4604	534.1250	565.5647	953.8950	1514.9158	2071.0161	2550.2852	(97)
Space heating kWh	1334.5596	1066.6677	919.2549	538.4222	246.4286	0.0000	0.0000	0.0000	0.0000	504.7008	930.1623	1330.2657	(98a)
Space heating requirement - total per year (kWh/year)												6870.4617	
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	1334.5596	1066.6677	919.2549	538.4222	246.4286	0.0000	0.0000	0.0000	0.0000	504.7008	930.1623	1330.2657	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6870.4617	
Space heating per m2											(98c) / (4) =	81.4808	(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 %)													84.0000	(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	1334.5596	1066.6677	919.2549	538.4222	246.4286	0.0000	0.0000	0.0000	0.0000	504.7008	930.1623	1330.2657	(98)	
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000	(210)	
Space heating fuel (main heating system)	1588.7614	1269.8425	1094.3511	640.9789	293.3673	0.0000	0.0000	0.0000	0.0000	600.8343	1107.3361	1583.6496	(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	301.5581	266.6458	282.6666	246.4992	237.6924	212.7626	208.7027	217.6194	220.7517	247.9017	265.8111	297.9506	(64)	
Efficiency of water heater	81.9586	81.7896	81.4126	80.5803	78.7735	74.0000	74.0000	74.0000	74.0000	80.4203	81.5507	81.9729	(216)	
Fuel for water heating, kWh/month	367.9394	326.0143	347.2024	305.9050	301.7415	287.5171	282.0307	294.0803	298.3131	308.2576	325.9459	363.4745	(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	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	33.8838	27.1829	24.4751	17.9315	13.8508	11.3163	12.6352	16.4237	21.3328	27.9898	31.6144	34.8256	(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													8179.1211	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													74.0000	
Water heating fuel used													3808.4219	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:														
central heating pump													41.0000	(230c)
main heating flue fan													45.0000	(230e)
Total electricity for the above, kWh/year													86.0000	(231)
Electricity for lighting (calculated in Appendix L)													273.4618	(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													12347.0048	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
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Space heating - main system 1	8179.1211	3.6400	297.7200 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3808.4219	3.6400	138.6266 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814 (249)
Energy for lighting	273.4618	16.4900	45.0939 (250)
Additional standing charges			92.0000 (251)
Total energy cost			587.6218 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.6358 (257)
SAP value		73.4834
SAP rating (Section 12)		73 (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	8179.1211	0.2100	1717.6154 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3808.4219	0.2100	799.7686 (264)
Space and water heating			2517.3840 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	273.4618	0.1443	39.4690 (268)
Total CO2, kg/year			2568.7823 (272)
CO2 emissions per m2			30.4600 (273)
EI value			73.3826
EI rating			73 (274)
EI band			C

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

1. Overall dwelling characteristics

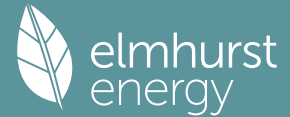
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	64.1700 (1b)	x 2.5000 (2b)	= 160.4250 (1b) -
First floor	20.1500 (1c)	x 2.3600 (2c)	= 47.5540 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.3200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	207.9790 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1442 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8942 (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) = 0.7601 (21)

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

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Wind speed	4.2000	4.0000	4.1000	3.7000	3.8000	3.2000	3.4000	3.7000	3.5000	3.7000	3.6000	4.0000 (22)
Wind factor	1.0500	1.0000	1.0250	0.9250	0.9500	0.8000	0.8500	0.9250	0.8750	0.9250	0.9000	1.0000 (22a)
Adj infilt rate												
Effective ac	0.7981	0.7601	0.7791	0.7031	0.7221	0.6081	0.6461	0.7031	0.6651	0.7031	0.6841	0.7601 (22b)
	0.8185	0.7889	0.8035	0.7472	0.7607	0.6849	0.7087	0.7472	0.7212	0.7472	0.7340	0.7889 (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
New Windows (Uw = 1.60)			10.8300	1.5038	16.2857		(27)
Exist. Windows (Uw = 2.10)			6.2100	1.9373	12.0304		(27)
New D to Corridor			2.0200	1.4000	2.8280		(26)
Opening 9			0.8500	2.8369	2.4113		(27a)
New Unh.W	20.7800	2.0200	18.7600	0.2300	4.3148	190.0000	3564.4000 (29a)
NEW EW	43.4000	6.0900	37.3100	0.2800	10.4468	110.0000	4104.1000 (29a)
Exist.Ext.W-TO BE IMPRO.	29.0800	6.2100	22.8700	0.5500	12.5785	190.0000	4345.3000 (29a)
New Timb. Wall	1.1400		1.1400	0.2800	0.3192	9.0000	10.2600 (29a)
Per. Solid W-TO BE IMPRO.	11.4500		11.4500	0.2600	2.9770	190.0000	2175.5000 (29a)
EW Solid-TO BE IMPRO.	27.6700	4.7400	22.9300	0.3000	6.8790	190.0000	4356.7000 (29a)
New Flat R	3.2900		3.2900	0.1800	0.5922	9.0000	29.6100 (30)
New Rins@Joists	40.7300		40.7300	0.1600	6.5168	9.0000	366.5700 (30)
Exist. Flat R-TO BE IMPRO.	14.7300		14.7300	0.1800	2.6514	9.0000	132.5700 (30)
Exist.Rins.@Raft.-TO BE IMPRO.	6.5300	0.8500	5.6800	0.1800	1.0224	9.0000	51.1200 (30)
Total net area of external elements Aum(A, m2)			198.8000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	81.8536		(33)
Party Wall 1			18.1300	0.0000	0.0000	180.0000	3263.4000 (32)
Party Floor 1			64.1700			40.0000	2566.8000 (32d)
Internal Wall 1			105.4500			100.0000	10545.0000 (32c)
Internal Floor 1			20.1500			18.0000	362.7000 (32d)
Internal Ceiling 1			20.1500			9.0000	181.3500 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	36055.3800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							427.6018 (35)
Thermal bridges (Default value 0.200 * total exposed area)							39.7600 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	121.6136 (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	56.1757	54.1434	55.1472	51.2809	52.2103	47.0057	48.6415	51.2809	49.4965	51.2809	50.3763	54.1434 (38)
Heat transfer coeff	177.7893	175.7570	176.7608	172.8945	173.8239	168.6194	170.2551	172.8945	171.1101	172.8945	171.9899	175.7570 (39)
Average = Sum(39)m / 12 =												173.3788
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	2.1085	2.0844	2.0963	2.0505	2.0615	1.9998	2.0192	2.0505	2.0293	2.0505	2.0397	2.0844 (40)
HLP (average)												2.0562
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5397 (42)
Hot water usage for mixer showers												
91.8538	90.4735	88.4620	84.6133	81.7731	78.6058	76.8055	78.8017	80.9900	84.3908	88.3221	91.5019 (42a)	
Hot water usage for baths												
28.8506	28.4221	27.8188	26.7062	25.8732	24.9495	24.4505	25.0497	25.7021	26.6905	27.8259	28.7531 (42b)	
Hot water usage for other uses												
40.6395	39.1617	37.6839	36.2061	34.7283	33.2505	33.2505	34.7283	36.2061	37.6839	39.1617	40.6395 (42c)	
Average daily hot water use (litres/day)												148.3802 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
161.3439	158.0573	153.9646	147.5256	142.3746	136.8058	134.5065	138.5797	142.8982	148.7651	155.3097	160.8944 (44)	
Energy content (annual)	255.5293	225.0714	236.6378	201.9552	191.6636	168.2186	162.6739	171.5906	176.2077	201.8729	221.2671	251.9218 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 2464.6101
38.3294	33.7607	35.4957	30.2933	28.7495	25.2328	24.4011	25.7386	26.4312	30.2809	33.1901	37.7883 (46)	
Water storage loss:												
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3600 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7344 (55)
Total storage loss												
22.7664	20.5632	22.7664	22.0320	22.7664	22.0320	22.7664	22.7664	22.0320	22.7664	22.0320	22.7664 (56)	
If cylinder contains dedicated solar storage												
22.7664	20.5632	22.7664	22.0320	22.7664	22.0320	22.7664	22.7664	22.0320	22.7664	22.0320	22.7664 (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												
301.5581	266.6458	282.6666	246.4992	237.6924	212.7626	208.7027	217.6194	220.7517	247.9017	265.8111	297.9506 (62)	
WVHRS	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												
301.5581	266.6458	282.6666	246.4992	237.6924	212.7626	208.7027	217.6194	220.7517	247.9017	265.8111	297.9506 (64)	

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Electric shower(s)	Total per year (kwh/year) = Sum(64)m =										3006.5621 (64)	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)	
Total Energy used by instantaneous electric shower(s) (kwh/year) = Sum(64a)m =											0.0000 (64a)	
Heat gains from water heating, kwh/month	121.7865	108.0958	115.5051	102.7853	100.5512	91.5679	90.9121	93.8769	94.2243	103.9458	109.2065	120.5870 (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	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	38.7113	34.3831	27.9622	21.1692	15.8242	13.3595	14.4354	18.7636	25.1845	31.9775	37.3225	39.7873	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.6449	344.1797	335.2721	316.3087	292.3709	269.8728	254.8426	251.3078	260.2154	279.1788	303.1166	325.6147	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	(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)	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	(71)
Water heating gains (Table 5)	163.6916	160.8568	155.2488	142.7574	135.1494	127.1776	122.1937	126.1787	130.8670	139.7121	151.6757	162.0794	(72)
Total internal gains	649.6208	645.9925	625.0560	586.8082	549.9175	513.9828	495.0446	499.8230	519.8399	557.4413	598.6877	634.0543	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	2.0500	12.9236	0.6300	0.7000	0.7700	8.0967 (75)
Southwest	8.7800	40.4699	0.6300	0.7000	0.7700	108.5922 (79)
North	1.3300	11.9814	0.6300	0.7000	0.7700	4.8700 (74)
Northeast	1.4600	12.9236	0.6300	0.7000	0.7700	5.7664 (75)
East	1.3300	22.3313	0.6300	0.7000	0.7700	9.0769 (76)
Southwest	2.0900	40.4699	0.6300	0.7000	0.7700	25.8494 (79)
Northeast	0.8500	19.3863	0.7600	0.7000	1.0000	7.8898 (82)

Solar gains	170.1415	261.1023	388.0205	538.1371	623.9869	684.9564	658.3356	584.4655	479.6832	327.1355	210.8514	142.9023	(83)
Total gains	819.7622	907.0948	1013.0766	1124.9453	1173.9044	1198.9392	1153.3803	1084.2885	999.5231	884.5768	809.5391	776.9566	(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	56.3329	56.9843	56.6607	57.9277	57.6180	59.3964	58.8258	57.9277	58.5318	57.9277	58.2324	56.9843	
alpha	4.7555	4.7990	4.7774	4.8618	4.8412	4.9598	4.9217	4.8618	4.9021	4.8618	4.8822	4.7990	
util living area	0.9978	0.9962	0.9891	0.9618	0.8692	0.6072	0.3673	0.4264	0.7878	0.9700	0.9949	0.9983 (86)	
MIT	19.5811	19.7151	20.0369	20.4469	20.7915	20.9772	20.9985	20.9967	20.9118	20.4985	19.9957	19.5566 (87)	
Th 2	19.2620	19.2777	19.2699	19.2999	19.2927	19.3335	19.3206	19.2999	19.3139	19.2999	19.3070	19.2777 (88)	
util rest of house	0.9963	0.9936	0.9808	0.9302	0.7597	0.3960	0.1211	0.1594	0.5949	0.9365	0.9905	0.9972 (89)	
MIT 2	18.0684	18.2133	18.5249	18.9372	19.2079	19.3313	19.3206	19.2999	19.2963	18.9931	18.5148	18.0559 (90)	
Living area fraction	fLA = Living area / (4) =												0.3178 (91)
MIT	18.5492	18.6906	19.0055	19.4171	19.7113	19.8544	19.8539	19.8392	19.8098	19.4716	18.9855	18.5329 (92)	
Temperature adjustment													-0.1500
adjusted MIT	18.3992	18.5406	18.8555	19.2671	19.5613	19.7044	19.7039	19.6892	19.6598	19.3216	18.8355	18.3829 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9952	0.9919	0.9779	0.9294	0.7811	0.4459	0.1777	0.2214	0.6418	0.9371	0.9886	0.9962	(94)
Useful gains	815.7987	899.7624	990.6792	1045.5090	916.9713	534.5755	204.9361	240.0636	641.4652	828.9223	800.3417	774.0385	(95)
Ext temp.	5.5000	5.9000	7.9000	10.4000	13.5000	16.5000	18.5000	18.3000	15.7000	12.1000	8.4000	5.4000	(96)
Heat loss rate W	2293.3405	2221.6766	1936.5006	1533.0676	1053.5911	540.3230	204.9703	240.1864	677.5557	1248.5690	1794.7992	2281.8310	(97)
Space heating kWh	1099.2911	888.3263	703.6912	351.0422	101.6451	0.0000	0.0000	0.0000	0.0000	312.2172	716.0094	1121.7976	(98a)
Space heating requirement - total per year (kWh/year)													5294.0201
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	1099.2911	888.3263	703.6912	351.0422	101.6451	0.0000	0.0000	0.0000	0.0000	312.2172	716.0094	1121.7976	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)													5294.0201

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Space heating per m2

(98c) / (4) = 62.7849 (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 %)													84.0000 (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	1099.2911	888.3263	703.6912	351.0422	101.6451	0.0000	0.0000	0.0000	0.0000	312.2172	716.0094	1121.7976	(98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000	(210)
Space heating fuel (main heating system)	1308.6799	1057.5313	837.7276	417.9074	121.0061	0.0000	0.0000	0.0000	0.0000	371.6871	852.3922	1335.4733	(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	301.5581	266.6458	282.6666	246.4992	237.6924	212.7626	208.7027	217.6194	220.7517	247.9017	265.8111	297.9506	(64)
Efficiency of water heater (217)m	81.6255	81.4586	80.8683	79.5646	76.7364	74.0000	74.0000	74.0000	74.0000	79.2596	81.0353	74.0000	(216)
Fuel for water heating, kWh/month	369.4411	327.3390	349.5397	309.8103	309.7519	287.5171	282.0307	294.0803	298.3131	312.7720	328.0190	364.7624	(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	33.8838	27.1829	24.4751	17.9315	13.8508	11.3163	12.6352	16.4237	21.3328	27.9898	31.6144	34.8256	(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													6302.4049 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													74.0000
Water heating fuel used													3833.3765 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
central heating pump													41.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													86.0000 (231)
Electricity for lighting (calculated in Appendix L)													273.4618 (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													10495.2432 (238)

10a. Fuel costs - using BEDF prices (521)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	6302.4049	3.5000	220.5842 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3833.3765	3.5000	134.1682 (247)
Energy for instantaneous electric shower(s)	0.0000	18.3900	0.0000 (247a)
Pumps, fans and electric keep-hot	86.0000	18.3900	15.8154 (249)
Energy for lighting	273.4618	18.3900	50.2896 (250)
Additional standing charges			94.0000 (251)
Total energy cost			514.8574 (255)

Full SAP Calculation Printout



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	6302.4049	0.2100	1323.5050 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3833.3765	0.2100	805.0091 (264)
Space and water heating			2128.5141 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	273.4618	0.1443	39.4690 (268)
Total CO2, kg/year			2179.9123 (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	6302.4049	1.1300	7121.7175 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3833.3765	1.1300	4331.7155 (278)
Space and water heating			11453.4330 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	273.4618	1.5338	419.4449 (282)
Total Primary energy kWh/year			12002.9786 (286)

Summary for Input Data

Property Reference	Flat 02-116 Norfolk Avenue	Issued on Date	30/06/2023
Assessment Reference	001-Baseline	Prop Type Ref	PR10687
Property	116, Norfolk Avenue, London, N13 6AJ		

SAP Rating	73 C	DER		TER	
Environmental	73 C	% DER < TER			N/A
CO ₂ Emissions (t/year)	2.18	DFEE		TFEE	
Compliance Check	See BREL	% DFEE < TFEE			
% DPER < TPER		DPER		TPER	

Assessor Details	Mr. Nikolas Koutsorizof	Assessor ID	U127-0001
Client	-, Chris Georgiou		

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	Northwest
Property Tenure	ND
Transaction Type	5
Terrain Type	Suburban
1.0 Property Type	Flat, End-Terrace
Position of Flat	Top-floor flat
Which Floor	1
2.0 Number of Storeys	2
3.0 Date Built	2023
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown
6.0 Thermal Mass Parameter	Precise calculation
7.0 Electricity Tariff	Standard
Smart electricity meter fitted	Yes
Smart gas meter fitted	Yes

7.0 Measurements	Ground floor: 1st Storey:	Heat Loss Perimeter 37.30 m 1.00 m	Internal Floor Area 64.17 m ² 20.15 m ²	Average Storey Height 2.50 m 2.36 m
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8.0 Living Area	26.80	m ²
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9.0 External Walls										
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area(m ²)	Nett Area (m ²)	Shelter Res	Shelter	Openings	Area Calculation Type
New Unh.W	Solid Wall	Solid wall : dense plaster, 200 mm dense block, insulated externally	0.28	190.00	20.78	18.76	0.82	Stairwell	2.02	Enter Gross Area
NEW EW	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.28	110.00	43.40	37.31	0.00	None	6.09	Enter Gross Area
Exist.Ext.W-TO BE IMPRO.	Cavity Wall	Cavity wall : dense plaster, dense block, filled cavity, any outside structure	0.55	190.00	29.08	22.88	0.00	None	6.20	Enter Gross Area
New Timb. Wall	Timber Frame	Timber framed wall (one layer of plasterboard)	0.28	9.00	1.14	1.14	0.00	None	0.00	Enter Gross Area
Per. Solid W-TO BE IMPRO.	Solid Wall	Solid wall : dense plaster, 200 mm dense block, insulated externally	0.30	190.00	11.45	11.45	0.50	Room In Roof	0.00	Enter Gross Area
EW Solid-TO BE IMPRO.	Solid Wall	Solid wall : dense plaster, 200 mm dense block, insulated externally	0.30	190.00	27.67	22.93	0.00	None	4.74	Enter Gross Area

9.1 Party Walls								
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)	Shelter Res	Shelter	
Party Wall 1	Filled Cavity with Edge Sealing	Dense plaster both sides, dense blocks, cavity or cavity fill	0.00	180.00	18.13			None

9.2 Internal Walls				
Description	Construction	Kappa (kJ/m ² K)	Area (m ²)	
Internal Wall 1	Dense block, dense plaster	100.00	105.45	

10.0 External Roofs										
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area(m ²)	Nett Area (m ²)	Shelter Code	Shelter Factor	Calculation Type	Openings

Summary for Input Data

New Flat R	External Flat Roof	Plasterboard, insulated flat roof	0.18	9.00	3.29	0.00	None	0.00	Enter Gross Area	0.00
New Rins@Joists	External Plane Roof	Plasterboard, insulated at ceiling level	0.16	9.00	40.73	0.00	None	0.00	Enter Gross Area	0.00
Exist. Flat R-TO BE IMPRO.	External Flat Roof	Plasterboard, insulated flat roof	0.18	9.00	14.73	0.00	None	0.00	Enter Gross Area	0.00
Exist.Rins.@Raft.-TO BE IMPRO.	External Slope Roof	Plasterboard, insulated slope	0.18	9.00	6.53	0.85	None	0.00	Enter Gross Area	0.85

10.2 Internal Ceilings

Description	Storey	Construction	Area (m²)
Internal Ceiling 1	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	20.15

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Precast concrete plank floor (screed laid on insulation), carpeted	30.00	64.17

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1		Plasterboard ceiling, carpeted chipboard floor	9.00	20.15

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
New Windows	Manufacturer	Window	Double Low-E Soft 0.1			0.63		0.70	1.60
Exist. Windows	SAP table	Window	Double Low-E Soft 0.1	12 mm	None	0.63	PVC	0.70	2.10
New D to Corridor	SAP table	Door to Corridor							1.40
Exist. RL	SAP table	Roof Window	Double glazed	12 mm	None	0.76	PVC	0.70	2.80

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Opening 1	New D to Corridor	New Unh.W	North West	2.02	
Opening 2	Exist. Windows	Exist.Ext.W-TO BE IMPRO.	North East	1.46	
Opening 3	Exist. Windows	Exist.Ext.W-TO BE IMPRO.	North	1.33	
Opening 4	Exist. Windows	Exist.Ext.W-TO BE IMPRO.	East	1.33	
Opening 5	New Windows	NEW EW	North East	2.05	
Opening 6	Exist. Windows	Exist.Ext.W-TO BE IMPRO.	South West	2.09	
Opening 7	New Windows	NEW EW	South West	4.04	
Opening 8	New Windows	EW Solid-TO BE IMPRO.	South West	4.74	
Opening 9	Exist. RL	Exist.Rins.@Raft.-TO BE IMPRO.	North East	0.85	40

14.0 Conservatory

None

15.0 Draught Proofing

100

 %

16.0 Draught Lobby

Yes

17.0 Thermal Bridging

Default

Y-value

0.20

 W/m²K

18.0 Pressure Testing

No

Test Method

Blower Door

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present

No

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System

No

22.0 Lighting

No Fixed Lighting

No

Name	Efficacy	Power	Capacity	Count
Low energy Lighting	75.00	2	150	9
Standard Lighting	50.00	2	100	3

24.0 Main Heating 1

SAP table

NOTIONAL Gas Boiler

100.00

 %

Mains gas

102

In Winter

84.00

Summary for Input Data

In Summer	74.00
Controls SAP Code	2106
PCDF Controls	0
Delayed Start Stat	Yes
Flue Type	Balanced
Fan Assisted Flue	Yes
Is MHS Pumped	Pump in heated space
Heating Pump Age	2013 or later
Heat Emitter	Radiators
Flow Temperature	Unknown
Boiler Interlock	Yes

25.0 Main Heating 2	None
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26.0 Heat Networks	None
--------------------	------

Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1									
Heat source 2									
Heat source 3									
Heat source 4									
Heat source 5									

28.0 Water Heating	
Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	2

28.1 Showers					
Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To

28.3 Waste Water Heat Recovery System	
---------------------------------------	--

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	210.00	L
Loss	1.36	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	

31.0 Thermal Store	None
--------------------	------

34.0 Small-scale Hydro	None
------------------------	------

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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Recommendations
Lower cost measures
None

Summary for Input Data



Further measures to achieve even higher standards

Typical Cost	Typical savings per year	Ratings after improvement	
		SAP rating	Environmental Impact
		0	0
		0	0
		0	0

Overview Report

Dwelling Address	116, Norfolk Avenue, London, N13 6AJ
Report Date	30/06/2023
Property Type	Flat, End-Terrace
Floor Area [m ²]	84

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

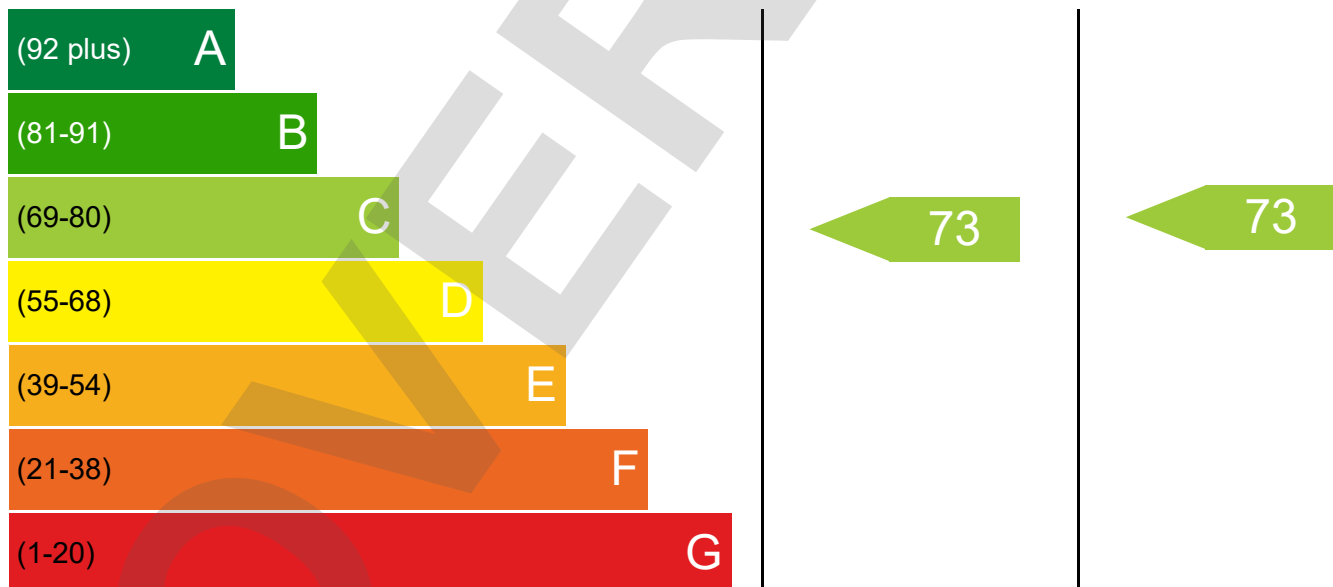
Energy Rating

The current energy rating represents the overall energy efficiency of the dwelling. The potential energy rating is the overall energy rating of the dwelling after all of the recommend measures provided on the next page have been installed. A higher score represents a more energy efficient dwelling with lower fuel bills.

Most energy efficient - lower running costs

CURRENT

POTENTIAL



Least energy efficient - higher running costs

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good
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Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.33 W/m ² K	Good
Roof	Average thermal transmittance 0.17 W/m ² K	Good
Windows	Fully double glazed	Average
Main heating	Boiler and radiators, mains gas	Good
Main heating controls	Programmer, room thermostat and TRVs	Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	(not tested)	

Primary Energy use

The primary energy use for this property per year is 142 kilowatt hour (kWh) per square metre

Estimated CO₂ emissions of the dwelling

The estimated CO rating provides an indication of the dwelling's impact on the environment in terms of carbon dioxide emissions; the higher the rating the less impact it has on the environment.

The estimated CO emissions for this dwellings is: **2.2** per year

With the recommended measures the potential CO emissions could be: **2** per year

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling. To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed. Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measure	Typical Yearly Saving	Potential Rating after measure installed	Cumulative savings (per year)	Cumulative Potential Rating
---------------------	-----------------------	--	-------------------------------	-----------------------------

Estimated energy use and potential savings

Estimated energy cost for this property over a year

£515

Over a year you could save

£0

The estimated cost and savings show how much the average household would spend in this property for heating, lighting and hot water. It is not based on how energy is used by the people living at the property.

Contacting the assessor and the accreditation scheme

Assessor contact details	
Assessor name	Mr. Nikolas Koutsorizof
Assessor's accreditation number	
Email Address	

Accreditation scheme contact details

Accreditation scheme	
Telephone	
Email Address	

Assessment details

Related party disclosure	
Date of assessment	30/06/2023
Date of certificate	30/06/2023
Type of assessment	SAP, existing dwelling

Full SAP Calculation Printout



Property Reference	Flat 02-116 Norfolk Avenue			Issued on Date	30/06/2023
Assessment Reference	002-be lean	Prop Type Ref	PR10687		
Property	116, Norfolk Avenue, London, N13 6AJ				
SAP Rating	62 D	DER		TER	
Environmental	92 A	% DER < TER			N/A
CO ₂ Emissions (t/year)	0.68	DFEE		TFEE	
Compliance Check	See BREL	% DFEE < TFEE			
% DPER < TPER		DPER		TPER	
Assessor Details	Mr. Iraj Maghounaki			Assessor ID	V571-0001
Client	- Chris Georgiou				

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	64.1700 (1b)	x 2.5000 (2b)	= 160.4250 (1b) -
First floor	20.1500 (1c)	x 2.3600 (2c)	= 47.5540 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.3200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	207.9790 (5)

2. Ventilation rate

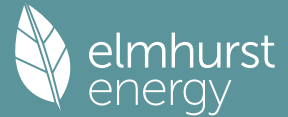
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 30.0000 / (5) = 0.1442 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3942 (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) = 0.3351 (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	0.4273	0.4189	0.4105	0.3686	0.3602	0.3184	0.3184	0.3100	0.3351	0.3602	0.3770	0.3938 (22b)
Effective ac	0.5913	0.5877	0.5843	0.5679	0.5649	0.5507	0.5507	0.5480	0.5561	0.5649	0.5711	0.5775 (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
New Windows (Uw = 1.40)			10.8300	1.3258	14.3580		(27)
Exist. Windows (Uw = 2.10)			6.2100	1.9373	12.0304		(27)
New D to Corridor			2.0200	1.4000	2.8280		(26)
Opening 9			0.8500	2.8369	2.4113		(27a)
New Unh.W	20.7800	2.0200	18.7600	0.1700	3.1892	150.0000	2814.0000 (29a)
NEW EW	43.4000	6.0900	37.3100	0.1800	6.7158	110.0000	4104.1000 (29a)
Exist.Ext.W-TO BE IMPRO.	29.0800	6.2100	22.8700	0.5500	12.5785	110.0000	2515.7000 (29a)

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New Timb. Wall	1.1400		1.1400	0.2000	0.2280	9.0000	10.2600 (29a)
Per. Solid W-TO BE IMPRO.	11.4500		11.4500	0.2600	2.9770	190.0000	2175.5000 (29a)
EW Solid-TO BE IMPRO.	27.6700	4.7400	22.9300	0.3000	6.8790	190.0000	4356.7000 (29a)
New Flat R	3.2900		3.2900	0.1500	0.4935	9.0000	29.6100 (30)
New Rins@Joists	40.7300		40.7300	0.1100	4.4803	9.0000	366.5700 (30)
Exist. Flat R-TO BE IMPRO.	14.7300		14.7300	0.1800	2.6514	9.0000	132.5700 (30)
Exist.Rins.@Raft.-TO BE IMPRO.	6.5300	0.8500	5.6800	0.1500	0.8520	9.0000	51.1200 (30)
Total net area of external elements Aum(A, m2)			198.8000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	72.6724			(33)
Party Wall 1			18.1300	0.0000	0.0000	180.0000	3263.4000 (32)
Party Floor 1			64.1700			80.0000	5133.6000 (32d)
Internal Wall 1			105.4500			100.0000	10545.0000 (32c)
Internal Floor 1			20.1500			18.0000	362.7000 (32d)
Internal Ceiling 1			20.1500			9.0000	181.3500 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	36042.1800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		427.4452 (35)
Thermal bridges (Default value 0.200 * total exposed area)		39.7600 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	112.4324 (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	(38)
Heat transfer coeff	40.5812	40.3379	40.0994	38.9795	38.7699	37.7945	37.7945	37.6138	38.1702	38.7699	39.1938	39.6370	(39)
Average = Sum(39)m / 12 =	153.0136	152.7703	152.5319	151.4119	151.2024	150.2269	150.2269	150.0463	150.6026	151.2024	151.6263	152.0695	(39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(40)
HLP (average)	1.8147	1.8118	1.8090	1.7957	1.7932	1.7816	1.7816	1.7795	1.7861	1.7932	1.7982	1.8035	(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													2.5397 (42)
Hot water usage for mixer showers	91.8538	90.4735	88.4620	84.6133	81.7731	78.6058	76.8055	78.8017	80.9900	84.3908	88.3221	91.5019	(42a)
Hot water usage for baths	28.8506	28.4221	27.8188	26.7062	25.8732	24.9495	24.4505	25.0497	25.7021	26.6905	27.8259	28.7531	(42b)
Hot water usage for other uses	40.6395	39.1617	37.6839	36.2061	34.7283	33.2505	33.2505	34.7283	36.2061	37.6839	39.1617	40.6395	(42c)
Average daily hot water use (litres/day)													148.3802 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	161.3439	158.0573	153.9646	147.5256	142.3746	136.8058	134.5065	138.5797	142.8982	148.7651	155.3097	160.8944	(44)
Energy content (annual)	255.5293	225.0714	236.6378	201.9552	191.6636	168.2186	162.6739	171.5906	176.2077	201.8729	221.2671	251.9218	(45)
Distribution loss (46)m = 0.15 x (45)m													Total = Sum(45)m = 2464.6101

Water storage loss:													
Store volume	38.3294	33.7607	35.4957	30.2933	28.7495	25.2328	24.4011	25.7386	26.4312	30.2809	33.1901	37.7883	(46)
a) If manufacturer declared loss factor is known (kWh/day):													150.0000 (47)
Temperature factor from Table 2b													1.3000 (48)
Enter (49) or (54) in (55)													0.5400 (49)
Total storage loss													0.7020 (55)

If cylinder contains dedicated solar storage	21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620	(56)
Primary loss	21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620	(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	300.5537	265.7386	281.6622	245.5272	236.6880	211.7906	207.6983	216.6150	219.7797	246.8973	264.8391	296.9462	(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)

Total per year (kWh/year) = Sum(64)m =	300.5537	265.7386	281.6622	245.5272	236.6880	211.7906	207.6983	216.6150	219.7797	246.8973	264.8391	296.9462	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
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Heat gains from water heating, kWh/month	120.9830	107.3700	114.7016	102.0077	99.7477	90.7903	90.1086	93.0734	93.4467	103.1423	108.4289	119.7835	(65)
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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	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	37.5967	33.3930	27.1570	20.5596	15.3686	12.9748	14.0197	18.2234	24.4594	31.0568	36.2478	38.6416	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	340.6449	344.1797	335.2721	316.3087	292.3709	269.8728	254.8426	251.3078	260.2154	279.1788	303.1166	325.6147	(69)

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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)	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895 (71)
Water heating gains (Table 5)	162.6116	159.7768	154.1688	141.6774	134.0694	126.0976	121.1137	125.0987	129.7870	138.6321	150.5957	160.9994 (72)
Total internal gains	647.4261	643.9225	623.1709	585.1187	548.3819	512.5181	493.5490	498.2027	518.0348	555.4405	596.5330	631.8286 (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	2.0500	11.2829	0.6300	0.7000	0.7700	7.0688 (75)
Southwest	8.7800	36.7938	0.6300	0.7000	0.7700	98.7282 (79)
North	1.3300	10.6334	0.6300	0.7000	0.7700	4.3221 (74)
Northeast	1.4600	11.2829	0.6300	0.7000	0.7700	5.0344 (75)
East	1.3300	19.6403	0.6300	0.7000	0.7700	7.9831 (76)
Southwest	2.0900	36.7938	0.6300	0.7000	0.7700	23.5014 (79)
Northeast	0.8500	16.8560	0.7600	0.7000	1.0000	6.8601 (82)

Solar gains	153.4981	270.9425	395.4277	530.6177	630.9030	642.2787	612.6033	535.4462	441.9273	306.1571	185.5927	130.2321 (83)
Total gains	800.9242	914.8650	1018.5986	1115.7363	1179.2849	1154.7968	1106.1523	1033.6490	959.9621	861.5976	782.1257	762.0607 (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, n _{l1} ,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	65.4302	65.5344	65.6369	66.1224	66.2140	66.6440	66.6440	66.7242	66.4777	66.2140	66.0289	65.8365
alpha	5.3620	5.3690	5.3758	5.4082	5.4143	5.4429	5.4429	5.4483	5.4318	5.4143	5.4019	5.3891
util living area	0.9986	0.9969	0.9916	0.9721	0.9080	0.7584	0.5824	0.6412	0.8760	0.9822	0.9970	0.9990 (86)
MIT	19.6733	19.8300	20.0913	20.4339	20.7459	20.9350	20.9873	20.9792	20.8497	20.4499	19.9947	19.6429 (87)
Th 2	19.4597	19.4618	19.4637	19.4730	19.4748	19.4829	19.4829	19.4844	19.4798	19.4748	19.4712	19.4676 (88)
util rest of house	0.9978	0.9950	0.9861	0.9523	0.8428	0.6145	0.3901	0.4446	0.7651	0.9655	0.9948	0.9983 (89)
MIT 2	18.3106	18.4681	18.7280	19.0653	19.3371	19.4647	19.4817	19.4819	19.4223	19.0884	18.6401	18.2864 (90)
Living area fraction	f _{LA} = Living area / (4) =											0.3178 (91)
MIT	18.7437	18.9010	19.1613	19.5003	19.7849	19.9320	19.9602	19.9578	19.8760	19.5211	19.0707	18.7176 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7437	18.9010	19.1613	19.5003	19.7849	19.9320	19.9602	19.9578	19.8760	19.5211	19.0707	18.7176 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9972	0.9940	0.9846	0.9527	0.8589	0.6616	0.4529	0.5095	0.8001	0.9662	0.9939	0.9979 (94)
Useful gains	798.7103	909.3617	1002.8841	1063.0073	1012.8429	764.0000	500.9330	526.6844	768.0614	832.4692	777.3897	760.4422 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	2210.0874	2138.9379	1931.2472	1605.0101	1222.4556	801.0171	504.7949	533.8385	869.8802	1348.8962	1815.0686	2207.6806 (97)
Space heating kWh	1050.0646	826.2752	690.7022	390.2420	155.9519	0.0000	0.0000	0.0000	0.0000	384.2217	747.1288	1076.7454 (98a)
Space heating requirement - total per year (kWh/year)												5321.3318
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	1050.0646	826.2752	690.7022	390.2420	155.9519	0.0000	0.0000	0.0000	0.0000	384.2217	747.1288	1076.7454 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5321.3318
Space heating per m ²												(98c) / (4) = 63.1088 (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 %)												170.0000 (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	1050.0646	826.2752	690.7022	390.2420	155.9519	0.0000	0.0000	0.0000	0.0000	384.2217	747.1288	1076.7454 (98)
Space heating efficiency (main heating system 1)	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000 (210)
Space heating fuel (main heating system)	617.6850	486.0442	406.2954	229.5541	91.7364	0.0000	0.0000	0.0000	0.0000	226.0128	439.4875	633.3796 (211)
Space heating efficiency (main heating system 2)												

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	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	300.5537	265.7386	281.6622	245.5272	236.6880	211.7906	207.6983	216.6150	219.7797	246.8973	264.8391	296.9462 (64)
Efficiency of water heater												170.0000 (216)
(217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000 (217)
Fuel for water heating, kWh/month	176.7963	156.3168	165.6837	144.4278	139.2282	124.5827	122.1755	127.4206	129.2822	145.2337	155.7877	174.6742 (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	32.9082	26.4001	23.7704	17.4152	13.4520	10.9904	12.2714	15.9508	20.7185	27.1838	30.7040	33.8228 (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												3130.1951 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												170.0000
Water heating fuel used												1761.6095 (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)												265.5876 (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												5157.3923 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3130.1951	16.4900	516.1692 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1761.6095	16.4900	290.4894 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	265.5876	16.4900	43.7954 (250)
Additional standing charges			0.0000 (251)
Total energy cost			850.4540 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	2.3675 (257)
SAP value	61.6230
SAP rating (Section 12)	62 (258)
SAP band	D

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	3130.1951	0.1552	485.8896 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1761.6095	0.1411	248.5120 (264)
Space and water heating			734.4016 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)

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Energy for lighting	265.5876	0.1443	38.3325 (268)
Total CO ₂ , kg/year			772.7341 (272)
CO ₂ emissions per m ²			9.1600 (273)
EI value			91.9930
EI rating			92 (274)
EI band			A

SAP 10 WORKSHEET FOR Conversion (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)
Ground floor	64.1700 (1b)	x 2.5000 (2b)	= 160.4250 (1b) -
First floor	20.1500 (1c)	x 2.3600 (2c)	= 47.5540 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.3200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	207.9790 (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	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 30.0000 / (5) = 0.1442 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3942 (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) = 0.3351 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.2000	4.0000	4.1000	3.7000	3.8000	3.2000	3.4000	3.7000	3.5000	3.7000	3.6000	4.0000 (22)
Adj infilt rate	1.0500	1.0000	1.0250	0.9250	0.9500	0.8000	0.8500	0.9250	0.8750	0.9250	0.9000	1.0000 (22a)
Effective ac	0.3519	0.3351	0.3435	0.3100	0.3184	0.2681	0.2848	0.3100	0.2932	0.3100	0.3016	0.3351 (22b)
	0.5619	0.5561	0.5590	0.5480	0.5507	0.5359	0.5406	0.5480	0.5430	0.5480	0.5455	0.5561 (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
New Windows (Uw = 1.40)			10.8300	1.3258	14.3580		(27)
Exist. Windows (Uw = 2.10)			6.2100	1.9373	12.0304		(27)
New D to Corridor			2.0200	1.4000	2.8280		(26)
Opening 9			0.8500	2.8369	2.4113		(27a)
New Unh.W	20.7800	2.0200	18.7600	0.1700	3.1892	150.0000	2814.0000 (29a)
NEW EW	43.4000	6.0900	37.3100	0.1800	6.7158	110.0000	4104.1000 (29a)
Exist.Ext.W-TO BE IMPRO.	29.0800	6.2100	22.8700	0.5500	12.5785	110.0000	2515.7000 (29a)
New Timb. Wall	1.1400		1.1400	0.2000	0.2280	9.0000	10.2600 (29a)
Per. Solid W-TO BE IMPRO.	11.4500		11.4500	0.2600	2.9770	190.0000	2175.5000 (29a)
EW Solid-TO BE IMPRO.	27.6700	4.7400	22.9300	0.3000	6.8790	190.0000	4356.7000 (29a)
New Flat R	3.2900		3.2900	0.1500	0.4935	9.0000	29.6100 (30)
New Rins@Joists	40.7300		40.7300	0.1100	4.4803	9.0000	366.5700 (30)
Exist. Flat R-TO BE IMPRO.	14.7300		14.7300	0.1800	2.6514	9.0000	132.5700 (30)
Exist.Rins.@Raft.-TO BE IMPRO.	6.5300	0.8500	5.6800	0.1500	0.8520	9.0000	51.1200 (30)
Total net area of external elements Aum(A, m ²)			198.8000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		72.6724		(33)
Party Wall 1			18.1300	0.0000	0.0000	180.0000	3263.4000 (32)
Party Floor 1			64.1700			80.0000	5133.6000 (32d)
Internal Wall 1			105.4500			100.0000	10545.0000 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	36042.1800	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		427.4452	(35)
Thermal bridges (Default value 0.200 * total exposed area)		39.7600	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	112.4324	(37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	38.5652	38.1702	38.3653	37.6138	37.7945	36.7829	37.1008	37.6138	37.2670	37.6138	37.4380	38.1702
Heat transfer coeff												
Average = Sum(39)m / 12 =	150.9976	150.6026	150.7977	150.0463	150.2269	149.2153	149.5333	150.0463	149.6994	150.0463	149.8705	150.6026

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.7908	1.7861	1.7884	1.7795	1.7816	1.7696	1.7734	1.7795	1.7754	1.7795	1.7774	1.7861 (40)
HLP (average)												1.7806
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

[illegible]

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	161.3439	158.0573	153.9646	147.5256	142.3746	136.8058	134.5065	138.5797	142.8982	148.7651	155.3097	160.8944 (44)
Energy conte	255.5293	225.0714	236.6378	201.9552	191.6636	168.2186	162.6739	171.5906	176.2077	201.8729	221.2671	251.9218 (45)
Energy content (annual)	Total = Sum(45)m = 2464.6101											
Distribution loss	(46)m = 0.15 x (45)m											
	38.3294	33.7607	35.4957	30.2933	28.7495	25.2328	24.4011	25.7386	26.4312	30.2809	33.1901	37.7883 (46)

21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620 (56)
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21.7620 19.6560 21.7620 21.0600 21.7620 21.0600 21.7620 21.7620 21.0600 21.7620 21.0600 21.7620 (57)

[illegible]

300.5537 265.7386 281.6622 245.5272 236.6880 211.7906 207.6983 216.6150 219.7797 246.8973 264.8391 296.9462 (62)

[illegible]

300.5537	265.7386	281.6622	245.5272	236.6880	211.7906	207.6983	216.6150	219.7797	246.8973	264.8391	296.9462 (64)
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Total per year (kWh/year) = Sum(64)m = 2994.7361 (64)

Electric shower(s)

[illegible]

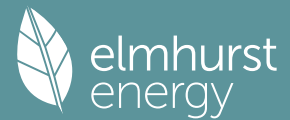
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843 (66)
Lighting gains	(calculated in Appendix L, equation L9 or L9a), also see Table 5											
	37.5967	33.3930	27.1570	20.5596	15.3686	12.9748	14.0197	18.2234	24.4594	31.0568	36.2478	38.6416 (67)
Appliances gains	(calculated in Appendix L, equation L13 or L13a), also see Table 5											
	340.6449	344.1797	335.2721	316.3087	292.3709	269.8728	254.8426	251.3078	260.2154	279.1788	303.1166	325.6147 (68)
Cooking gains	(calculated in Appendix L, equation L15 or L15a), also see Table 5											
	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782 (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)	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895 (71)
Water heating gains (Table 5)	162.6116	159.7768	154.1688	141.6774	134.0694	126.0976	121.1137	125.0987	129.7870	138.6321	150.5957	160.9994 (72)
Total internal gains	647.4261	643.9225	623.1709	585.1187	548.3819	512.5181	493.5490	498.2027	518.0348	555.4405	596.5330	631.8286 (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
Northeast				2.0500	12.9236		0.6300		0.7000		0.7700		8.0967 (75)
Southwest				8.7800	40.4699		0.6300		0.7000		0.7700		108.5922 (79)
North				1.3300	11.9814		0.6300		0.7000		0.7700		4.8700 (74)
Northeast				1.4600	12.9236		0.6300		0.7000		0.7700		5.7664 (75)
East				1.3300	22.3313		0.6300		0.7000		0.7700		9.0769 (76)
Southwest				2.0900	40.4699		0.6300		0.7000		0.7700		25.8494 (79)
Northeast				0.8500	19.3863		0.7600		0.7000		1.0000		7.8898 (82)
Solar gains	170.1415	261.1023	388.0205	538.1371	623.9869	684.9564	658.3356	584.4655	479.6832	327.1355	210.8514	142.9023	(83)
Total gains	817.5676	905.0248	1011.1914	1123.2558	1172.3688	1197.4745	1151.8846	1082.6682	997.7179	882.5760	807.3844	774.7309	(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	66.3038	66.4777	66.3917	66.7242	66.6440	67.0958	66.9531	66.7242	66.8788	66.7242	66.8025	66.4777
alpha	5.4203	5.4318	5.4261	5.4483	5.4429	5.4731	5.4635	5.4483	5.4586	5.4483	5.4535	5.4318
util living area	0.9978	0.9960	0.9869	0.9506	0.8275	0.5501	0.3241	0.3731	0.7349	0.9618	0.9944	0.9984 (86)
MIT	19.8447	19.9593	20.2592	20.6034	20.8813	20.9903	20.9996	20.9991	20.9543	20.6309	20.1763	19.8053 (87)
Th 2	19.4765	19.4798	19.4781	19.4844	19.4829	19.4913	19.4887	19.4844	19.4873	19.4844	19.4859	19.4798 (88)
util rest of house	0.9964	0.9933	0.9776	0.9140	0.7153	0.3717	0.1283	0.1641	0.5567	0.9234	0.9899	0.9973 (89)
MIT 2	18.4946	18.6108	18.9041	19.2292	19.4372	19.4904	19.4887	19.4844	19.4786	19.2621	18.8316	18.4580 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.9237	19.0394	19.3348	19.6660	19.8962	19.9671	19.9689	19.9658	19.9476	19.6972	19.2590	18.8862 (91)
Temperature adjustment	0.0000											
adjusted MIT	18.9237	19.0394	19.3348	19.6660	19.8962	19.9671	19.9689	19.9658	19.9476	19.6972	19.2590	18.8862 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9956	0.9922	0.9764	0.9196	0.7503	0.4295	0.1907	0.2308	0.6164	0.9307	0.9889	0.9967 (94)
Useful gains	814.0013	897.9688	987.3144	1032.9343	879.6232	514.3600	219.6287	249.8842	615.0054	821.3996	798.3899	772.1735 (95)
Ext temp.	5.5000	5.9000	7.9000	10.4000	13.5000	16.5000	18.5000	18.3000	15.7000	12.1000	8.4000	5.4000 (96)
Heat loss rate W	2026.9531	1978.8339	1724.3379	1390.3233	960.8772	517.3465	219.6494	249.9496	635.8644	1139.9255	1627.4403	2031.0591 (97)
Space heating kWh	902.4361	726.3414	548.3455	257.3201	60.4529	0.0000	0.0000	0.0000	0.0000	236.9832	596.9163	936.6109 (98a)
Space heating requirement - total per year (kWh/year)												4265.4063
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	902.4361	726.3414	548.3455	257.3201	60.4529	0.0000	0.0000	0.0000	0.0000	236.9832	596.9163	936.6109 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4265.4063
Space heating per m2										(98c) / (4) =		50.5859 (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 %)												170.0000 (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	902.4361	726.3414	548.3455	257.3201	60.4529	0.0000	0.0000	0.0000	0.0000	236.9832	596.9163	936.6109 (98)
Space heating efficiency (main heating system 1)	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000 (210)
Space heating fuel (main heating system)	530.8448	427.2596	322.5561	151.3647	35.5606	0.0000	0.0000	0.0000	0.0000	139.4019	351.1272	550.9476 (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	300.5537	265.7386	281.6622	245.5272	236.6880	211.7906	207.6983	216.6150	219.7797	246.8973	264.8391	296.9462 (64)
Efficiency of water heater												170.0000 (216)
(217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000 (217)
Fuel for water heating, kWh/month												

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	176.7963	156.3168	165.6837	144.4278	139.2282	124.5827	122.1755	127.4206	129.2822	145.2337	155.7877	174.6742	(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	32.9082	26.4001	23.7704	17.4152	13.4520	10.9904	12.2714	15.9508	20.7185	27.1838	30.7040	33.8228	(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												2509.0625	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												170.0000	
Water heating fuel used												1761.6095	(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)												265.5876	(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												4536.2597	(238)

10a. Fuel costs - using BEDF prices (521)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2509.0625	18.3900	461.4166 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1761.6095	18.3900	323.9600 (247)
Energy for instantaneous electric shower(s)	0.0000	18.3900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	265.5876	18.3900	48.8416 (250)
Additional standing charges			0.0000 (251)
Total energy cost			834.2182 (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	2509.0625	0.1564	392.3628 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1761.6095	0.1411	248.5120 (264)
Space and water heating			640.8748 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	265.5876	0.1443	38.3325 (268)
Total CO2, kg/year			679.2073 (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	2509.0625	1.5790	3961.7091 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1761.6095	1.5216	2680.5319 (278)
Space and water heating			6642.2410 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	265.5876	1.5338	407.3672 (282)
Total Primary energy kWh/year			7049.6082 (286)

SAP 10 EPC IMPROVEMENTS

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Current energy efficiency rating: D 62
Current environmental impact rating: A 92

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

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

Potential energy efficiency rating: D 62
Potential environmental impact rating: A 92

Fuel prices for cost data on this page from database revision number 521 TEST (19 Jun 2023)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current £834	Potential £834	Saving £0
Electricity			
Space heating	£461	£461	£0
Water heating	£324	£324	£0
Lighting	£49	£49	£0
Total cost of fuels	£834	£834	£0
Total cost of uses	£834	£834	£0
Delivered energy	54 kWh/m²	54 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.7 tonnes	0.7 tonnes	0.0 tonnes
CO2 emissions per m²	8 kg/m²	8 kg/m²	0 kg/m²
Primary energy	84 kWh/m²	84 kWh/m²	0 kWh/m²

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

1. Overall dwelling characteristics

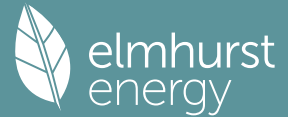
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	64.1700 (1b)	x 2.5000 (2b)	= 160.4250 (1b) -
First floor	20.1500 (1c)	x 2.3600 (2c)	= 47.5540 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.3200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 207.9790 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1442 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3942 (18)
Number of sides sheltered	2 (19)

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Shelter factor

Infiltration rate adjusted to include shelter factor

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

$$(21) = (18) \times (20) = 0.3351 \quad (21)$$

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
Effective ac	0.4273	0.4189	0.4105	0.3686	0.3602	0.3184	0.3184	0.3100	0.3351	0.3602	0.3770	0.3938	(22b)
	0.5913	0.5877	0.5843	0.5679	0.5649	0.5507	0.5507	0.5480	0.5561	0.5649	0.5711	0.5775	(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	
New Windows (Uw = 1.40)			10.8300	1.3258	14.3580			(27)
Exist. Windows (Uw = 2.10)			6.2100	1.9373	12.0304			(27)
New D to Corridor			2.0200	1.4000	2.8280			(26)
Opening 9			0.8500	2.8369	2.4113			(27a)
New Unh.W	20.7800	2.0200	18.7600	0.1700	3.1892	150.0000	2814.0000	(29a)
NEW EW	43.4000	6.0900	37.3100	0.1800	6.7158	110.0000	4104.1000	(29a)
Exist.Ext.W-TO BE IMPRO.	29.0800	6.2100	22.8700	0.5500	12.5785	110.0000	2515.7000	(29a)
New Timb. Wall	1.1400		1.1400	0.2000	0.2280	9.0000	10.2600	(29a)
Per. Solid W-TO BE IMPRO.	11.4500		11.4500	0.2600	2.9770	190.0000	2175.5000	(29a)
EW Solid-TO BE IMPRO.	27.6700	4.7400	22.9300	0.3000	6.8790	190.0000	4356.7000	(29a)
New Flat R	3.2900		3.2900	0.1500	0.4935	9.0000	29.6100	(30)
New Rins@Joists	40.7300		40.7300	0.1100	4.4803	9.0000	366.5700	(30)
Exist. Flat R-TO BE IMPRO.	14.7300		14.7300	0.1800	2.6514	9.0000	132.5700	(30)
Exist.Rins.@Raft.-TO BE IMPRO.	6.5300	0.8500	5.6800	0.1500	0.8520	9.0000	51.1200	(30)
Total net area of external elements Aum(A, m2)			198.8000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	72.6724			(33)
Party Wall 1			18.1300	0.0000	0.0000	180.0000	3263.4000	(32)
Party Floor 1			64.1700			80.0000	5133.6000	(32d)
Internal Wall 1			105.4500			100.0000	10545.0000	(32c)
Internal Floor 1			20.1500			18.0000	362.7000	(32d)
Internal Ceiling 1			20.1500			9.0000	181.3500	(32e)

Heat capacity Cm = Sum(A x k)

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

Thermal bridges (Default value 0.200 * total exposed area)

Point Thermal bridges

Total fabric heat loss

$$(28)...(30) + (32) + (32a)...(32e) = 36042.1800 \quad (34)$$

$$427.4452 \quad (35)$$

$$39.7600 \quad (36)$$

$$(36a) = 0.0000$$

$$(33) + (36) + (36a) = 112.4324 \quad (37)$$

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	40.5812	40.3379	40.0994	38.9795	38.7699	37.7945	37.7945	37.6138	38.1702	38.7699	39.1938	39.6370	(38)
Heat transfer coeff	153.0136	152.7703	152.5319	151.4119	151.2024	150.2269	150.2269	150.0463	150.6026	151.2024	151.6263	152.0695	(39)
Average = Sum(39)m / 12 =													151.4109

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.8147	1.8118	1.8090	1.7957	1.7932	1.7816	1.7816	1.7795	1.7861	1.7932	1.7982	1.8035	(40)
HLP (average)													1.7957
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5397	(42)
Hot water usage for mixer showers	91.8538	90.4735	88.4620	84.6133	81.7731	78.6058	76.8055	78.8017	80.9900	84.3908	88.3221	91.5019	(42a)
Hot water usage for baths	28.8506	28.4221	27.8188	26.7062	25.8732	24.9495	24.4505	25.0497	25.7021	26.6905	27.8259	28.7531	(42b)
Hot water usage for other uses	40.6395	39.1617	37.6839	36.2061	34.7283	33.2505	33.2505	34.7283	36.2061	37.6839	39.1617	40.6395	(42c)
Average daily hot water use (litres/day)												148.3802	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	161.3439	158.0573	153.9646	147.5256	142.3746	136.8058	134.5065	138.5797	142.8982	148.7651	155.3097	160.8944	(44)
Distribution loss (46)m = 0.15 x (45)m	255.5293	225.0714	236.6378	201.9552	191.6636	168.2186	162.6739	171.5906	176.2077	201.8729	221.2671	251.9218	(45)
Water storage loss:												Total = Sum(45)m =	2464.6101
Store volume	38.3294	33.7607	35.4957	30.2933	28.7495	25.2328	24.4011	25.7386	26.4312	30.2809	33.1901	37.7883	(46)
a) If manufacturer declared loss factor is known (kWh/day):												150.0000	(47)
Temperature factor from Table 2b												1.3000	(48)
Enter (49) or (54) in (55)												0.5400	(49)
Total storage loss												0.7020	(55)
If cylinder contains dedicated solar storage	21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620	(56)
Primary loss	21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620	(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	300.5537	265.7386	281.6622	245.5272	236.6880	211.7906	207.6983	216.6150	219.7797	246.8973	264.8391	296.9462	(62)
	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	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	300.5537	265.7386	281.6622	245.5272	236.6880	211.7906	207.6983	216.6150	219.7797	246.8973	264.8391	296.9462	(64)
Total per year (kWh/year) = Sum(64)m =												2994.7361	(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	120.9830	107.3700	114.7016	102.0077	99.7477	90.7903	90.1086	93.0734	93.4467	103.1423	108.4289	119.7835	(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	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	37.5967	33.3930	27.1570	20.5596	15.3686	12.9748	14.0197	18.2234	24.4594	31.0568	36.2478	38.6416	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.6449	344.1797	335.2721	316.3087	292.3709	269.8728	254.8426	251.3078	260.2154	279.1788	303.1166	325.6147	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	(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)	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	(71)
Water heating gains (Table 5)	162.6116	159.7768	154.1688	141.6774	134.0694	126.0976	121.1137	125.0987	129.7870	138.6321	150.5957	160.9994	(72)
Total internal gains	647.4261	643.9225	623.1709	585.1187	548.3819	512.5181	493.5490	498.2027	518.0348	555.4405	596.5330	631.8286	(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	2.0500	11.2829	0.6300	0.7000	0.7700	7.0688	(75)
Southwest	8.7800	36.7938	0.6300	0.7000	0.7700	98.7282	(79)
North	1.3300	10.6334	0.6300	0.7000	0.7700	4.3221	(74)
Northeast	1.4600	11.2829	0.6300	0.7000	0.7700	5.0344	(75)
East	1.3300	19.6403	0.6300	0.7000	0.7700	7.9831	(76)
Southwest	2.0900	36.7938	0.6300	0.7000	0.7700	23.5014	(79)
Northeast	0.8500	16.8560	0.7600	0.7000	1.0000	6.8601	(82)

Solar gains	153.4981	270.9425	395.4277	530.6177	630.9030	642.2787	612.6033	535.4462	441.9273	306.1571	185.5927	130.2321	(83)
Total gains	800.9242	914.8650	1018.5986	1115.7363	1179.2849	1154.7968	1106.1523	1033.6490	959.9621	861.5976	782.1257	762.0607	(84)

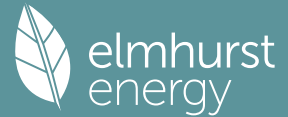
7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, n _{l,m} (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.4302	65.5344	65.6369	66.1224	66.2140	66.6440	66.6440	66.7242	66.4777	66.2140	66.0289	65.8365	
alpha	5.3620	5.3690	5.3758	5.4082	5.4143	5.4429	5.4429	5.4483	5.4318	5.4143	5.4019	5.3891	
util living area	0.9986	0.9969	0.9916	0.9721	0.9080	0.7584	0.5824	0.6412	0.8760	0.9822	0.9970	0.9990	(86)
MIT	19.6733	19.8300	20.0913	20.4339	20.7459	20.9350	20.9873	20.9792	20.8497	20.4499	19.9947	19.6429	(87)
Th 2	19.4597	19.4618	19.4637	19.4730	19.4748	19.4829	19.4829	19.4844	19.4798	19.4748	19.4712	19.4676	(88)
util rest of house	0.9978	0.9950	0.9861	0.9523	0.8428	0.6145	0.3901	0.4446	0.7651	0.9655	0.9948	0.9983	(89)
MIT 2	18.3106	18.4681	18.7280	19.0653	19.3371	19.4647	19.4817	19.4819	19.4223	19.0884	18.6401	18.2864	(90)
Living area fraction									f _{LA} = Living area / (4) =			0.3178	(91)
MIT	18.7437	18.9010	19.1613	19.5003	19.7849	19.9320	19.9602	19.9578	19.8760	19.5211	19.0707	18.7176	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7437	18.9010	19.1613	19.5003	19.7849	19.9320	19.9602	19.9578	19.8760	19.5211	19.0707	18.7176	(93)

8. Space heating requirement

Utilisation	0.9972	0.9940	0.9846	0.9527	0.8589	0.6616	0.4529	0.5095	0.8001	0.9662	0.9939	0.9979	(94)
Useful gains	798.7103	909.3617	1002.8841	1063.0073	1012.8429	764.0000	500.9330	526.6844	768.0614	832.4692	777.3897	760.4422	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	2210.0874	2138.9379	1931.2472	1605.0101	1222.4556	801.0171	504.7949	533.8385	869.8802	1348.8962	1815.0686	2207.6806	(97)
Space heating kWh	1050.0646	826.2752	690.7022	390.2420	155.9519	0.0000	0.0000	0.0000	0.0000	384.2217	747.1288	1076.7454	(98a)
Space heating requirement - total per year (kWh/year)												5321.3318	
Solar heating kWh													

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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	1050.0646	826.2752	690.7022	390.2420	155.9519	0.0000	0.0000	0.0000	0.0000	384.2217	747.1288	1076.7454 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5321.3318
Space heating per m2										(98c) / (4) =		63.1088 (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 %)												170.0000 (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	1050.0646	826.2752	690.7022	390.2420	155.9519	0.0000	0.0000	0.0000	0.0000	384.2217	747.1288	1076.7454 (98)
Space heating efficiency (main heating system 1)	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000 (210)
Space heating fuel (main heating system)	617.6850	486.0442	406.2954	229.5541	91.7364	0.0000	0.0000	0.0000	0.0000	226.0128	439.4875	633.3796 (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	300.5537	265.7386	281.6622	245.5272	236.6880	211.7906	207.6983	216.6150	219.7797	246.8973	264.8391	296.9462 (64)
Efficiency of water heater	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000 (216)
Fuel for water heating, kWh/month	176.7963	156.3168	165.6837	144.4278	139.2282	124.5827	122.1755	127.4206	129.2822	145.2337	155.7877	174.6742 (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	32.9082	26.4001	23.7704	17.4152	13.4520	10.9904	12.2714	15.9508	20.7185	27.1838	30.7040	33.8228 (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												3130.1951 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												170.0000
Water heating fuel used												1761.6095 (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)												265.5876 (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												5157.3923 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3130.1951	16.4900	516.1692 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1761.6095	16.4900	290.4894 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	265.5876	16.4900	43.7954 (250)
Additional standing charges			0.0000 (251)

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Total energy cost

850.4540 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):

Energy cost factor (ECF)

SAP value

SAP rating (Section 12)

SAP band

$$\begin{aligned} & 0.3600 \quad (256) \\ & [(255) \times (256)] / [(4) + 45.0] = 2.3675 \quad (257) \\ & 61.6230 \\ & 62 \quad (258) \\ & D \end{aligned}$$

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	3130.1951	0.1552	485.8896 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1761.6095	0.1411	248.5120 (264)
Space and water heating			734.4016 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	265.5876	0.1443	38.3325 (268)
Total CO2, kg/year			772.7341 (272)
CO2 emissions per m2			9.1600 (273)
EI value			91.9930
EI rating			92 (274)
EI band			A

SAP 10 WORKSHEET FOR Conversion (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)
Ground floor	64.1700 (1b)	x 2.5000 (2b)	= 160.4250 (1b) -
First floor	20.1500 (1c)	x 2.3600 (2c)	= 47.5540 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.3200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	207.9790 (5)

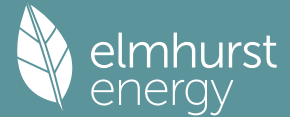
2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1442 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3942 (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) =	0.3351 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.1000	3.7000	3.8000	3.2000	3.4000	3.7000	3.5000	3.7000	3.6000	4.0000 (22)
Wind factor	1.0500	1.0000	1.0250	0.9250	0.9500	0.8000	0.8500	0.9250	0.8750	0.9250	0.9000	1.0000 (22a)
Adj infilt rate	0.3519	0.3351	0.3435	0.3100	0.3184	0.2681	0.2848	0.3100	0.2932	0.3100	0.3016	0.3351 (22b)
Effective ac	0.5619	0.5561	0.5590	0.5480	0.5507	0.5359	0.5406	0.5480	0.5430	0.5480	0.5455	0.5561 (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	
New Windows (Uw = 1.40)			10.8300	1.3258	14.3580			(27)
Exist. Windows (Uw = 2.10)			6.2100	1.9373	12.0304			(27)
New D to Corridor			2.0200	1.4000	2.8280			(26)
Opening 9			0.8500	2.8369	2.4113			(27a)
New Unh.W	20.7800	2.0200	18.7600	0.1700	3.1892	150.0000	2814.0000	(29a)
NEW EW	43.4000	6.0900	37.3100	0.1800	6.7158	110.0000	4104.1000	(29a)
Exist.Ext.W-TO BE IMPRO.	29.0800	6.2100	22.8700	0.5500	12.5785	110.0000	2515.7000	(29a)
New Timb. Wall	1.1400		1.1400	0.2000	0.2280	9.0000	10.2600	(29a)
Per. Solid W-TO BE IMPRO.	11.4500		11.4500	0.2600	2.9770	190.0000	2175.5000	(29a)
EW Solid-TO BE IMPRO.	27.6700	4.7400	22.9300	0.3000	6.8790	190.0000	4356.7000	(29a)
New Flat R	3.2900		3.2900	0.1500	0.4935	9.0000	29.6100	(30)
New Rins@Joists	40.7300		40.7300	0.1100	4.4803	9.0000	366.5700	(30)
Exist. Flat R-TO BE IMPRO.	14.7300		14.7300	0.1800	2.6514	9.0000	132.5700	(30)
Exist.Rins.@Raft.-TO BE IMPRO.	6.5300	0.8500	5.6800	0.1500	0.8520	9.0000	51.1200	(30)
Total net area of external elements Aum(A, m2)			198.8000					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	72.6724		(33)
Party Wall 1			18.1300	0.0000	0.0000	180.0000	3263.4000	(32)
Party Floor 1			64.1700			80.0000	5133.6000	(32d)
Internal Wall 1			105.4500			100.0000	10545.0000	(32c)
Internal Floor 1			20.1500			18.0000	362.7000	(32d)
Internal Ceiling 1			20.1500			9.0000	181.3500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 36042.1800 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 427.4452 (35)

Thermal bridges (Default value 0.200 * total exposed area) 39.7600 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 112.4324 (37)

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

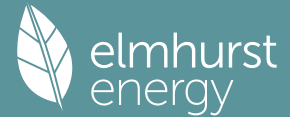
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	38.5652	38.1702	38.3653	37.6138	37.7945	36.7829	37.1008	37.6138	37.2670	37.6138	37.4380	38.1702	(38)
Heat transfer coeff	150.9976	150.6026	150.7977	150.0463	150.2269	149.2153	149.5333	150.0463	149.6994	150.0463	149.8705	150.6026	(39)
Average = Sum(39)m / 12 =												150.1404	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.7908	1.7861	1.7884	1.7795	1.7816	1.7696	1.7734	1.7795	1.7754	1.7795	1.7774	1.7861	(40)
HLP (average)												1.7806	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5397 (42)
Hot water usage for mixer showers	91.8538	90.4735	88.4620	84.6133	81.7731	78.6058	76.8055	78.8017	80.9900	84.3908	88.3221	91.5019	(42a)
Hot water usage for baths	28.8506	28.4221	27.8188	26.7062	25.8732	24.9495	24.4505	25.0497	25.7021	26.6905	27.8259	28.7531	(42b)
Hot water usage for other uses	40.6395	39.1617	37.6839	36.2061	34.7283	33.2505	33.2505	34.7283	36.2061	37.6839	39.1617	40.6395	(42c)
Average daily hot water use (litres/day)												148.3802	(43)
Daily hot water use	161.3439	158.0573	153.9646	147.5256	142.3746	136.8058	134.5065	138.5797	142.8982	148.7651	155.3097	160.8944	(44)
Energy conte	255.5293	225.0714	236.6378	201.9552	191.6636	168.2186	162.6739	171.5906	176.2077	201.8729	221.2671	251.9218	(45)
Energy content (annual)										Total = Sum(45)m =		2464.6101	
Distribution loss (46)m = 0.15 x (45)m	38.3294	33.7607	35.4957	30.2933	28.7495	25.2328	24.4011	25.7386	26.4312	30.2809	33.1901	37.7883	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7020	(55)
Total storage loss	21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620	(56)
If cylinder contains dedicated solar storage	21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620	(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	300.5537	265.7386	281.6622	245.5272	236.6880	211.7906	207.6983	216.6150	219.7797	246.8973	264.8391	296.9462	(62)
WVHRS	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	300.5537	265.7386	281.6622	245.5272	236.6880	211.7906	207.6983	216.6150	219.7797	246.8973	264.8391	296.9462	(64)
Total per year (kWh/year) = Sum(64)m =												2994.7361	(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	120.9830	107.3700	114.7016	102.0077	99.7477	90.7903	90.1086	93.0734	93.4467	103.1423	108.4289	119.7835	(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	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	37.5967	33.3930	27.1570	20.5596	15.3686	12.9748	14.0197	18.2234	24.4594	31.0568	36.2478	38.6416	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.6449	344.1797	335.2721	316.3087	292.3709	269.8728	254.8426	251.3078	260.2154	279.1788	303.1166	325.6147	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	(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)	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	(71)
Water heating gains (Table 5)	162.6116	159.7768	154.1688	141.6774	134.0694	126.0976	121.1137	125.0987	129.7870	138.6321	150.5957	160.9994	(72)
Total internal gains	647.4261	643.9225	623.1709	585.1187	548.3819	512.5181	493.5490	498.2027	518.0348	555.4405	596.5330	631.8286	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Northeast				2.0500	12.9236	0.6300	0.7000	0.7700	8.0967 (75)			
Southwest				8.7800	40.4699	0.6300	0.7000	0.7700	108.5922 (79)			
North				1.3300	11.9814	0.6300	0.7000	0.7700	4.8700 (74)			
Northeast				1.4600	12.9236	0.6300	0.7000	0.7700	5.7664 (75)			
East				1.3300	22.3313	0.6300	0.7000	0.7700	9.0769 (76)			
Southwest				2.0900	40.4699	0.6300	0.7000	0.7700	25.8494 (79)			
Northeast				0.8500	19.3863	0.7600	0.7000	1.0000	7.8898 (82)			
Solar gains	170.1415	261.1023	388.0205	538.1371	623.9869	684.9564	658.3356	584.4655	479.6832	327.1355	210.8514	142.9023 (83)
Total gains	817.5676	905.0248	1011.1914	1123.2558	1172.3688	1197.4745	1151.8846	1082.6682	997.7179	882.5760	807.3844	774.7309 (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)
tau	66.3038	66.4777	66.3917	66.7242	66.6440	67.0958	66.9531	66.7242	66.8788	66.7242	66.8025	66.4777	
alpha	5.4203	5.4318	5.4261	5.4483	5.4429	5.4731	5.4635	5.4483	5.4586	5.4483	5.4535	5.4318	
util living area	0.9978	0.9960	0.9869	0.9506	0.8275	0.5501	0.3241	0.3731	0.7349	0.9618	0.9944	0.9984	(86)
MIT	19.8447	19.9593	20.2592	20.6034	20.8813	20.9903	20.9996	20.9991	20.9543	20.6309	20.1763	19.8053	(87)
Th 2	19.4765	19.4798	19.4781	19.4844	19.4829	19.4913	19.4887	19.4844	19.4873	19.4844	19.4859	19.4798	(88)
util rest of house	0.9964	0.9933	0.9776	0.9140	0.7153	0.3717	0.1283	0.1641	0.5567	0.9234	0.9899	0.9973	(89)
MIT 2	18.4946	18.6108	18.9041	19.2292	19.4372	19.4904	19.4887	19.4844	19.4786	19.2621	18.8316	18.4580	(90)
Living area fraction	18.9237	19.0394	19.3348	19.6660	19.8962	19.9671	19.9689	19.9658	19.9476	19.6972	19.2590	18.8862	(91)
MIT	18.9237	19.0394	19.3348	19.6660	19.8962	19.9671	19.9689	19.9658	19.9476	19.6972	19.2590	18.8862	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9237	19.0394	19.3348	19.6660	19.8962	19.9671	19.9689	19.9658	19.9476	19.6972	19.2590	18.8862	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9956	0.9922	0.9764	0.9196	0.7503	0.4295	0.1907	0.2308	0.6164	0.9307	0.9889	0.9967	(94)
Useful gains	814.0013	897.9688	987.3144	1032.9343	879.6232	514.3600	219.6287	249.8842	615.0054	821.3996	798.3899	772.1735	(95)
Ext temp.	5.5000	5.9000	7.9000	10.4000	13.5000	16.5000	18.5000	18.3000	15.7000	12.1000	8.4000	5.4000	(96)
Heat loss rate W	2026.9531	1978.8339	1724.3379	1390.3233	960.8772	517.3465	219.6494	249.9496	635.8644	1139.9255	1627.4403	2031.0591	(97)
Space heating kWh	902.4361	726.3414	548.3455	257.3201	60.4529	0.0000	0.0000	0.0000	0.0000	236.9832	596.9163	936.6109	(98a)
Space heating requirement - total per year (kWh/year)												4265.4063	
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	902.4361	726.3414	548.3455	257.3201	60.4529	0.0000	0.0000	0.0000	0.0000	236.9832	596.9163	936.6109	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4265.4063	
Space heating per m2										(98c) / (4) =		50.5859	(99)

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

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Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	170.0000	(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	902.4361	726.3414	548.3455	257.3201	60.4529	0.0000	0.0000	0.0000	0.0000	236.9832	596.9163	936.6109	(98)
Space heating efficiency (main heating system 1)	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000	(210)
Space heating fuel (main heating system)	530.8448	427.2596	322.5561	151.3647	35.5606	0.0000	0.0000	0.0000	0.0000	139.4019	351.1272	550.9476	(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	300.5537	265.7386	281.6622	245.5272	236.6880	211.7906	207.6983	216.6150	219.7797	246.8973	264.8391	296.9462	(64)
Efficiency of water heater	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	(216)
Fuel for water heating, kWh/month	176.7963	156.3168	165.6837	144.4278	139.2282	124.5827	122.1755	127.4206	129.2822	145.2337	155.7877	174.6742	(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	32.9082	26.4001	23.7704	17.4152	13.4520	10.9904	12.2714	15.9508	20.7185	27.1838	30.7040	33.8228	(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												2509.0625	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												170.0000	
Water heating fuel used												1761.6095	(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)	265.5876	(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	4536.2597	(238)

10a. Fuel costs - using BEDF prices (521)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2509.0625	18.3900	461.4166	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1761.6095	18.3900	323.9600	(247)
Energy for instantaneous electric shower(s)	0.0000	18.3900	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	265.5876	18.3900	48.8416	(250)
Additional standing charges			0.0000	(251)
Total energy cost			834.2182	(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	2509.0625	0.1564	392.3628	(261)
Total CO2 associated with community systems			0.0000	(373)

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Water heating (other fuel)	1761.6095	0.1411	248.5120 (264)
Space and water heating			640.8748 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	265.5876	0.1443	38.3325 (268)
Total CO ₂ , kg/year			679.2073 (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	2509.0625	1.5790	3961.7091	(275)
Total CO ₂ associated with community systems			0.0000	(473)
Water heating (other fuel)	1761.6095	1.5216	2680.5319	(278)
Space and water heating			6642.2410	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	265.5876	1.5338	407.3672	(282)
Total Primary energy kWh/year			7049.6082	(286)

Summary for Input Data

Property Reference	Flat 02-116 Norfolk Avenue	Issued on Date	30/06/2023
Assessment Reference	002-be lean	Prop Type Ref	PR10687
Property	116, Norfolk Avenue, London, N13 6AJ		

SAP Rating	62 D	DER		TER	
Environmental	92 A	% DER < TER			N/A
CO ₂ Emissions (t/year)	0.68	DFEE		TFEE	
Compliance Check	See BREL	% DFEE < TFEE			
% DPER < TPER		DPER		TPER	

Assessor Details	Mr. Iraj Maghounaki	Assessor ID	V571-0001
Client	-, Chris Georgiou		

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	Northwest
Property Tenure	ND
Transaction Type	5
Terrain Type	Suburban
1.0 Property Type	Flat, End-Terrace
Position of Flat	Top-floor flat
Which Floor	1
2.0 Number of Storeys	2
3.0 Date Built	2023
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown
6.0 Thermal Mass Parameter	Precise calculation
7.0 Electricity Tariff	Standard
Smart electricity meter fitted	Yes
Smart gas meter fitted	Yes

7.0 Measurements		Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground floor:	37.30 m	64.17 m ²	2.50 m
	1st Storey:	1.00 m	20.15 m ²	2.36 m

8.0 Living Area	26.80	m ²
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Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area(m ²)	Nett Area (m ²)	Shelter Res	Shelter	Openings	Area Calculation Type
New Unh.W	Solid Wall	Solid wall : plasterboard on dabs, 200 mm dense block, insulated externally	0.20	150.00	20.78	18.76	0.82	Stairwell	2.02	Enter Gross Area
NEW EW	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.18	110.00	43.40	37.31	0.00	None	6.09	Enter Gross Area
Exist.Ext.W-TO BE IMPRO.	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.55	110.00	29.08	22.88	0.00	None	6.20	Enter Gross Area
New Timb. Wall	Timber Frame	Timber framed wall (one layer of plasterboard)	0.20	9.00	1.14	1.14	0.00	None	0.00	Enter Gross Area
Per. Solid W-TO BE IMPRO.	Solid Wall	Solid wall : dense plaster, 200 mm dense block, insulated externally	0.30	190.00	11.45	11.45	0.50	Room In Roof	0.00	Enter Gross Area
EW Solid-TO BE IMPRO.	Solid Wall	Solid wall : dense plaster, 200 mm dense block, insulated externally	0.30	190.00	27.67	22.93	0.00	None	4.74	Enter Gross Area

Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Dense plaster both sides, dense blocks, cavity or cavity fill	0.00	180.00	18.13		None

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Internal Wall 1	Dense block, dense plaster	100.00	105.45

Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area(m ²)	Nett Area	Shelter Code	Shelter Factor	Calculation Openings Type
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Summary for Input Data

New Flat R	External Flat Roof	Plasterboard, insulated flat roof	0.15	9.00	3.29	(m ²) 0.00	None	0.00	Enter Gross Area	0.00
New Rins@Joists	External Plane Roof	Plasterboard, insulated at ceiling level	0.11	9.00	40.73	0.00	None	0.00	Enter Gross Area	0.00
Exist. Flat R-TO BE IMPRO.	External Flat Roof	Plasterboard, insulated flat roof	0.18	9.00	14.73	0.00	None	0.00	Enter Gross Area	0.00
Exist.Rins.@Raft.-TO BE IMPRO.	External Slope Roof	Plasterboard, insulated slope	0.15	9.00	6.53	0.85	None	0.00	Enter Gross Area	0.85

10.2 Internal Ceilings

Description	Storey	Construction	Area (m ²)
Internal Ceiling 1	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	20.15

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m ² K)	Area (m ²)
Party Floor 1	+1	Concrete floor slab, carpeted	100.00	64.17

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m ² K)	Area (m ²)
Internal Floor 1		Plasterboard ceiling, carpeted chipboard floor	9.00	20.15

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m ² K)
New Windows	Manufacturer	Window	Double Low-E Soft 0.1			0.63		0.70	1.40
Exist. Windows	SAP table	Window	Double Low-E Soft 0.1	12 mm	None	0.63	PVC	0.70	2.10
New D to Corridor	SAP table	Door to Corridor							1.40
Exist. RL	SAP table	Roof Window	Double glazed	12 mm	None	0.76	PVC	0.70	2.80

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m ²)	Pitch
Opening 1	New D to Corridor	New Unh.W	North West	2.02	
Opening 2	Exist. Windows	Exist.Ext.W-TO BE IMPRO.	North East	1.46	
Opening 3	Exist. Windows	Exist.Ext.W-TO BE IMPRO.	North	1.33	
Opening 4	Exist. Windows	Exist.Ext.W-TO BE IMPRO.	East	1.33	
Opening 5	New Windows	NEW EW	North East	2.05	
Opening 6	Exist. Windows	Exist.Ext.W-TO BE IMPRO.	South West	2.09	
Opening 7	New Windows	NEW EW	South West	4.04	
Opening 8	New Windows	EW Solid-TO BE IMPRO.	South West	4.74	
Opening 9	Exist. RL	Exist.Rins.@Raft.-TO BE IMPRO.	North East	0.85	40

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

Y-value

 W/m²K

18.0 Pressure Testing

Designed AP₅₀

 m³/(h.m²) @ 50 Pa

Property Tested?

Test Method

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System

22.0 Lighting

No Fixed Lighting

Name	Efficacy	Power	Capacity	Count
Low energy Lighting	75.00	2	150	12

24.0 Main Heating 1

Percentage of Heat

 %

Fuel Type

SAP Code

Summary for Input Data

In Winter	170.00
In Summer	170.00
Controls SAP Code	2210
PCDF Controls	0
Is MHS Pumped	Pump in heated space
Heating Pump Age	2013 or later
Heat Emitter	Radiators
Flow Temperature	Enter value
Flow Temperature Value	35.00

25.0 Main Heating 2	None
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26.0 Heat Networks	None
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	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1										
Heat source 2										
Heat source 3										
Heat source 4										
Heat source 5										

28.0 Water Heating	
Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	2
Supplementary Immersion	No
Immersion Only Heating Hot Water	No

28.1 Showers					
Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To

28.3 Waste Water Heat Recovery System	
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29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	150.00	L
Loss	1.30	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	

31.0 Thermal Store	None
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34.0 Small-scale Hydro	None
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Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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Recommendations	
Lower cost measures	
None	

Summary for Input Data



Further measures to achieve even higher standards

Typical Cost	Typical savings per year	Ratings after improvement	
		SAP rating	Environmental Impact
		0	0
		0	0
		0	0

Overview Report

Dwelling Address	116, Norfolk Avenue, London, N13 6AJ
Report Date	30/06/2023
Property Type	Flat, End-Terrace
Floor Area [m ²]	84

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

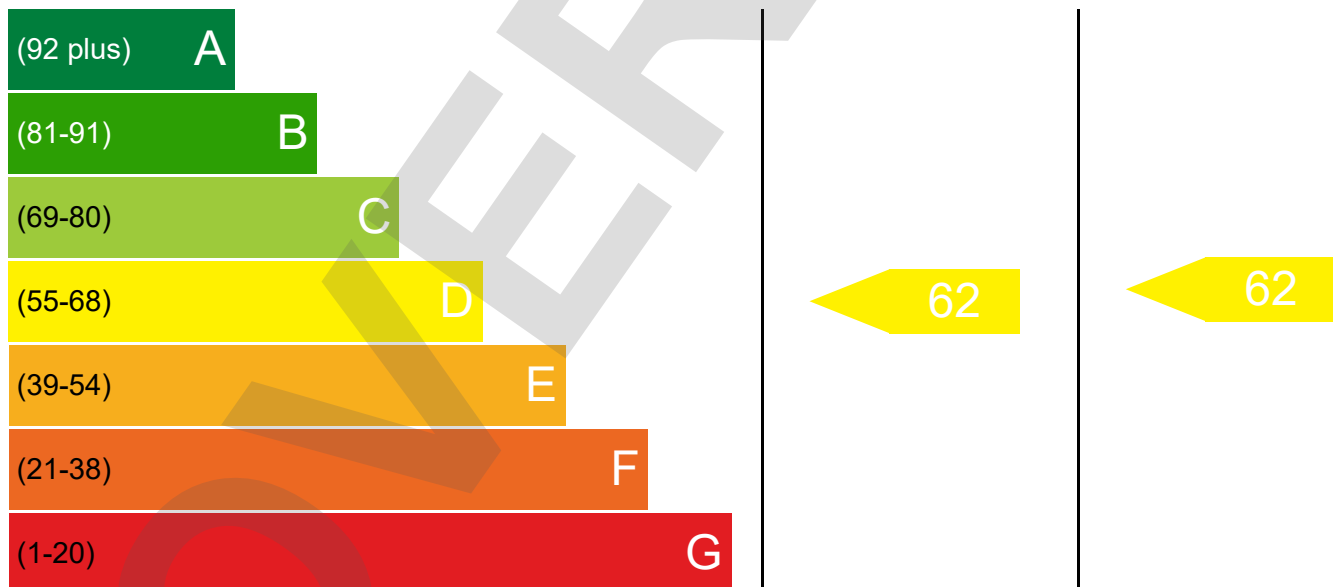
Energy Rating

The current energy rating represents the overall energy efficiency of the dwelling. The potential energy rating is the overall energy rating of the dwelling after all of the recommend measures provided on the next page have been installed. A higher score represents a more energy efficient dwelling with lower fuel bills.

Most energy efficient - lower running costs

CURRENT

POTENTIAL



Least energy efficient - higher running costs

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good
-----------	------	---------	------	-----------

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.28 W/m ² K	Good
Roof	Average thermal transmittance 0.13 W/m ² K	Very Good
Windows	Fully double glazed	Average
Main heating	Air source heat pump, radiators, electric	Average
Main heating controls	Programmer, room thermostat and TRVs	Good
Secondary heating	None	
Hot water	From main system	Average
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 5.0 m ³ /h.m ² (assumed)	Good

Primary Energy use

The primary energy use for this property per year is 84 kilowatt hour (kWh) per square metre

Estimated CO₂ emissions of the dwelling

The estimated CO rating provides an indication of the dwelling's impact on the environment in terms of carbon dioxide emissions; the higher the rating the less impact it has on the environment.

The estimated CO emissions for this dwellings is: **0.7** per year

With the recommended measures the potential CO emissions could be: **1** per year

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling. To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed. Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measure	Typical Yearly Saving	Potential Rating after measure installed	Cumulative savings (per year)	Cumulative Potential Rating
---------------------	-----------------------	--	-------------------------------	-----------------------------

Estimated energy use and potential savings

Estimated energy cost for this property over a year

£834

Over a year you could save

£0

The estimated cost and savings show how much the average household would spend in this property for heating, lighting and hot water. It is not based on how energy is used by the people living at the property.

Contacting the assessor and the accreditation scheme

Assessor contact details	
Assessor name	Mr. Iraj Maghounaki
Assessor's accreditation number	
Email Address	

Accreditation scheme contact details

Accreditation scheme	
Telephone	
Email Address	

Assessment details

Related party disclosure	
Date of assessment	30/06/2023
Date of certificate	30/06/2023
Type of assessment	SAP, existing dwelling

Full SAP Calculation Printout



Property Reference	Flat 02-116 Norfolk Avenue			Issued on Date	30/06/2023
Assessment Reference	003-be green	Prop Type Ref	PR10687		
Property	116, Norfolk Avenue, London, N13 6AJ				
SAP Rating	74 C	DER		TER	
Environmental	95 A	% DER < TER			N/A
CO ₂ Emissions (t/year)	0.47	DFEE		TFEE	
Compliance Check	See BREL		% DFEE < TFEE		
% DPER < TPER		DPER		TPER	
Assessor Details	Mr. Nikolas Koutsorizof			Assessor ID	U127-0001
Client	-, Chris Georgiou				

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	64.1700 (1b)	x 2.5000 (2b)	= 160.4250 (1b) -
First floor	20.1500 (1c)	x 2.3600 (2c)	= 47.5540 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.3200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	207.9790 (5)

2. Ventilation rate

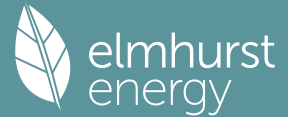
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 30.0000 / (5) = 0.1442 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3942 (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) = 0.3351 (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	0.4273	0.4189	0.4105	0.3686	0.3602	0.3184	0.3184	0.3100	0.3351	0.3602	0.3770	0.3938 (22b)
Effective ac	0.5913	0.5877	0.5843	0.5679	0.5649	0.5507	0.5507	0.5480	0.5561	0.5649	0.5711	0.5775 (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
New Windows (Uw = 1.40)			10.8300	1.3258	14.3580		(27)
Exist. Windows (Uw = 2.10)			6.2100	1.9373	12.0304		(27)
New D to Corridor			2.0200	1.4000	2.8280		(26)
Opening 9			0.8500	2.8369	2.4113		(27a)
New Unh.W	20.7800	2.0200	18.7600	0.1700	3.1892	150.0000	2814.0000 (29a)
NEW EW	43.4000	6.0900	37.3100	0.1800	6.7158	110.0000	4104.1000 (29a)
Exist.Ext.W-TO BE IMPRO.	29.0800	6.2100	22.8700	0.5500	12.5785	110.0000	2515.7000 (29a)

Full SAP Calculation Printout



New Timb. Wall	1.1400		1.1400	0.2000	0.2280	9.0000	10.2600 (29a)
Per. Solid W-TO BE IMPRO.	11.4500		11.4500	0.2600	2.9770	190.0000	2175.5000 (29a)
EW Solid-TO BE IMPRO.	27.6700	4.7400	22.9300	0.3000	6.8790	190.0000	4356.7000 (29a)
New Flat R	3.2900		3.2900	0.1500	0.4935	9.0000	29.6100 (30)
New Rins@Joists	40.7300		40.7300	0.1100	4.4803	9.0000	366.5700 (30)
Exist. Flat R-TO BE IMPRO.	14.7300		14.7300	0.1800	2.6514	9.0000	132.5700 (30)
Exist.Rins.@Raft.-TO BE IMPRO.	6.5300	0.8500	5.6800	0.1500	0.8520	9.0000	51.1200 (30)
Total net area of external elements Aum(A, m2)			198.8000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	72.6724			(33)
Party Wall 1			18.1300	0.0000	0.0000	180.0000	3263.4000 (32)
Party Floor 1			64.1700			80.0000	5133.6000 (32d)
Internal Wall 1			105.4500			100.0000	10545.0000 (32c)
Internal Floor 1			20.1500			18.0000	362.7000 (32d)
Internal Ceiling 1			20.1500			9.0000	181.3500 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	36042.1800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		427.4452 (35)
Thermal bridges (Default value 0.200 * total exposed area)		39.7600 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	112.4324 (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	(38)
Heat transfer coeff	40.5812	40.3379	40.0994	38.9795	38.7699	37.7945	37.7945	37.6138	38.1702	38.7699	39.1938	39.6370	(39)
Average = Sum(39)m / 12 =	153.0136	152.7703	152.5319	151.4119	151.2024	150.2269	150.2269	150.0463	150.6026	151.2024	151.6263	152.0695	(39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(40)
HLP (average)	1.8147	1.8118	1.8090	1.7957	1.7932	1.7816	1.7816	1.7795	1.7861	1.7932	1.7982	1.8035	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	(40)

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5397 (42)
Hot water usage for mixer showers	91.8538	90.4735	88.4620	84.6133	81.7731	78.6058	76.8055	78.8017	80.9900	84.3908	88.3221	91.5019	(42a)
Hot water usage for baths	28.8506	28.4221	27.8188	26.7062	25.8732	24.9495	24.4505	25.0497	25.7021	26.6905	27.8259	28.7531	(42b)
Hot water usage for other uses	40.6395	39.1617	37.6839	36.2061	34.7283	33.2505	33.2505	34.7283	36.2061	37.6839	39.1617	40.6395	(42c)
Average daily hot water use (litres/day)													148.3802 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	161.3439	158.0573	153.9646	147.5256	142.3746	136.8058	134.5065	138.5797	142.8982	148.7651	155.3097	160.8944	(44)
Energy content (annual)	255.5293	225.0714	236.6378	201.9552	191.6636	168.2186	162.6739	171.5906	176.2077	201.8729	221.2671	251.9218	(45)
Distribution loss (46)m = 0.15 x (45)m													Total = Sum(45)m = 2464.6101

Water storage loss:													
Store volume	38.3294	33.7607	35.4957	30.2933	28.7495	25.2328	24.4011	25.7386	26.4312	30.2809	33.1901	37.7883	(46)
a) If manufacturer declared loss factor is known (kWh/day):													150.0000 (47)
Temperature factor from Table 2b													1.3000 (48)
Enter (49) or (54) in (55)													0.5400 (49)
Total storage loss													0.7020 (55)

If cylinder contains dedicated solar storage	21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620	(56)
Primary loss	21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620	(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	300.5537	265.7386	281.6622	245.5272	236.6880	211.7906	207.6983	216.6150	219.7797	246.8973	264.8391	296.9462	(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)

Electric shower(s)	300.5537	265.7386	281.6622	245.5272	236.6880	211.7906	207.6983	216.6150	219.7797	246.8973	264.8391	296.9462	(64)
Total per year (kWh/year) = Sum(64)m =													2994.7361 (64)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	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	120.9830	107.3700	114.7016	102.0077	99.7477	90.7903	90.1086	93.0734	93.4467	103.1423	108.4289	119.7835	(65)
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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	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	37.5967	33.3930	27.1570	20.5596	15.3686	12.9748	14.0197	18.2234	24.4594	31.0568	36.2478	38.6416	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	340.6449	344.1797	335.2721	316.3087	292.3709	269.8728	254.8426	251.3078	260.2154	279.1788	303.1166	325.6147	(69)

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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)	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895 (71)
Water heating gains (Table 5)	162.6116	159.7768	154.1688	141.6774	134.0694	126.0976	121.1137	125.0987	129.7870	138.6321	150.5957	160.9994 (72)
Total internal gains	644.4261	640.9225	620.1709	582.1187	545.3819	512.5181	493.5490	498.2027	518.0348	552.4405	593.5330	628.8286 (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
Northeast	2.0500	11.2829	0.6300	0.7000	0.7700	7.0688 (75)
Southwest	8.7800	36.7938	0.6300	0.7000	0.7700	98.7282 (79)
North	1.3300	10.6334	0.6300	0.7000	0.7700	4.3221 (74)
Northeast	1.4600	11.2829	0.6300	0.7000	0.7700	5.0344 (75)
East	1.3300	19.6403	0.6300	0.7000	0.7700	7.9831 (76)
Southwest	2.0900	36.7938	0.6300	0.7000	0.7700	23.5014 (79)
Northeast	0.8500	16.8560	0.7600	0.7000	1.0000	6.8601 (82)

Solar gains	153.4981	270.9425	395.4277	530.6177	630.9030	642.2787	612.6033	535.4462	441.9273	306.1571	185.5927	130.2321 (83)
Total gains	797.9242	911.8650	1015.5986	1112.7363	1176.2849	1154.7968	1106.1523	1033.6490	959.9621	858.5976	779.1257	759.0607 (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, n _{l,m} (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	65.4302	65.5344	65.6369	66.1224	66.2140	66.6440	66.6440	66.7242	66.4777	66.2140	66.0289	65.8365
alpha	5.3620	5.3690	5.3758	5.4082	5.4143	5.4429	5.4429	5.4483	5.4318	5.4143	5.4019	5.3891
util living area	0.9987	0.9969	0.9917	0.9724	0.9088	0.7584	0.5824	0.6412	0.8760	0.9825	0.9971	0.9990 (86)
Living	19.6710	19.8278	20.0891	20.4320	20.7446	20.9350	20.9873	20.9792	20.8497	20.4478	19.9925	19.6407
Non living	17.9824	18.1839	18.5169	18.9476	19.2969	19.4596	19.4813	19.4813	19.4061	18.9766	18.4020	17.9491
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	20.3201	19.8278	20.0891	20.4320	20.7446	20.9350	20.9873	20.9792	20.8497	20.4478	19.9925	19.8308 (87)
Th 2	19.4597	19.4618	19.4637	19.4730	19.4748	19.4829	19.4829	19.4844	19.4798	19.4748	19.4712	19.4676 (88)
util rest of house	0.9979	0.9951	0.9863	0.9528	0.8438	0.6145	0.3901	0.4446	0.7651	0.9660	0.9949	0.9984 (89)
MIT 2	18.8708	18.1839	18.5169	18.9476	19.2969	19.4596	19.4813	19.4813	19.4061	18.9766	18.4020	18.2227 (90)
Living area fraction									f _{LA} = Living area / (4) =			0.3178 (91)
MIT	19.3314	18.7064	19.0166	19.4194	19.7570	19.9285	19.9600	19.9574	19.8649	19.4442	18.9075	18.7338 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3314	18.7064	19.0166	19.4194	19.7570	19.9285	19.9600	19.9574	19.8649	19.4442	18.9075	18.7338 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9978	0.9937	0.9840	0.9518	0.8585	0.6612	0.4528	0.5095	0.7992	0.9655	0.9937	0.9979 (94)
Useful gains	796.1370	906.1000	999.3355	1059.1432	1009.8410	763.5915	500.8992	526.6186	767.1800	828.9600	774.1851	757.4878 (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	2300.0129	2109.2115	1909.1820	1592.7580	1218.2424	800.4906	504.7596	533.7676	868.2094	1337.2631	1790.3246	2210.1508 (97)
Space heating kWh	1118.8836	808.4909	676.9258	384.2026	155.0506	0.0000	0.0000	0.0000	0.0000	378.1775	731.6204	1080.7812 (98a)
Space heating requirement - total per year (kWh/year)												5334.1327
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	1118.8836	808.4909	676.9258	384.2026	155.0506	0.0000	0.0000	0.0000	0.0000	378.1775	731.6204	1080.7812 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5334.1327
Space heating per m2										(98c) / (4) =		63.2606 (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 %)												348.8278 (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	1118.8836	808.4909	676.9258	384.2026	155.0506	0.0000	0.0000	0.0000	0.0000	378.1775	731.6204	1080.7812 (98)

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Space heating efficiency (main heating system 1)	348.8278	348.8278	348.8278	348.8278	348.8278	0.0000	0.0000	0.0000	0.0000	348.8278	348.8278	348.8278	(210)
Space heating fuel (main heating system)	320.7553	231.7737	194.0573	110.1411	44.4490	0.0000	0.0000	0.0000	0.0000	108.4138	209.7369	309.8323	(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	300.5537	265.7386	281.6622	245.5272	236.6880	211.7906	207.6983	216.6150	219.7797	246.8973	264.8391	296.9462	(64)
Efficiency of water heater													(216)
(217)m	176.7788	176.7788	176.7788	176.7788	176.7788	176.7788	176.7788	176.7788	176.7788	176.7788	176.7788	176.7788	(217)
Fuel for water heating, kWh/month	170.0168	150.3227	159.3303	138.8895	133.8893	119.8054	117.4905	122.5345	124.3247	139.6645	149.8138	167.9761	(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	32.9082	26.4001	23.7704	17.4152	13.4520	10.9904	12.2714	15.9508	20.7185	27.1838	30.7040	33.8228	(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												1529.1594	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												176.7788	
Water heating fuel used												1694.0582	(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)												265.5876	(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												3488.8053	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1529.1594	16.4900	252.1584	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1694.0582	16.4900	279.3502	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	265.5876	16.4900	43.7954	(250)
Additional standing charges			0.0000	(251)
Total energy cost			575.3040	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)		1.6015	(257)
SAP value	$[(255) \times (256)] / [(4) + 45.0] =$	74.0393	
SAP rating (Section 12)		74	(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
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Space heating - main system 1	1529.1594	0.1554	237.5923 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1694.0582	0.1411	238.9824 (264)
Space and water heating			476.5748 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	265.5876	0.1443	38.3325 (268)
Total CO2, kg/year			514.9073 (272)
CO2 emissions per m2			6.1100 (273)
EI value			94.6646
EI rating			95 (274)
EI band			A

SAP 10 WORKSHEET FOR Conversion (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)
Ground floor	64.1700 (1b)	x 2.5000 (2b)	= 160.4250 (1b) -
First floor	20.1500 (1c)	x 2.3600 (2c)	= 47.5540 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.3200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 207.9790 (5)

2. Ventilation rate

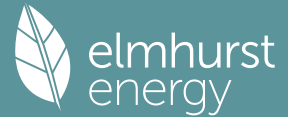
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 30.0000 / (5) = 0.1442 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3942 (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) = 0.3351 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.1000	3.7000	3.8000	3.2000	3.4000	3.7000	3.5000	3.7000	3.6000	4.0000 (22)
Wind factor	1.0500	1.0000	1.0250	0.9250	0.9500	0.8000	0.8500	0.9250	0.8750	0.9250	0.9000	1.0000 (22a)
Adj infilt rate	0.3519	0.3351	0.3435	0.3100	0.3184	0.2681	0.2848	0.3100	0.2932	0.3100	0.3016	0.3351 (22b)
Effective ac	0.5619	0.5561	0.5590	0.5480	0.5507	0.5359	0.5406	0.5480	0.5430	0.5480	0.5455	0.5561 (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
New Windows (Uw = 1.40)			10.8300	1.3258	14.3580		(27)
Exist. Windows (Uw = 2.10)			6.2100	1.9373	12.0304		(27)
New D to Corridor			2.0200	1.4000	2.8280		(26)
Opening 9			0.8500	2.8369	2.4113		(27a)
New Unh.W	20.7800	2.0200	18.7600	0.1700	3.1892	150.0000	2814.0000 (29a)
NEW EW	43.4000	6.0900	37.3100	0.1800	6.7158	110.0000	4104.1000 (29a)
Exist.Ext.W-TO BE IMPRO.	29.0800	6.2100	22.8700	0.5500	12.5785	110.0000	2515.7000 (29a)
New Timb. Wall	1.1400		1.1400	0.2000	0.2280	9.0000	10.2600 (29a)
Per. Solid W-TO BE IMPRO.	11.4500		11.4500	0.2600	2.9770	190.0000	2175.5000 (29a)
EW Solid-TO BE IMPRO.	27.6700	4.7400	22.9300	0.3000	6.8790	190.0000	4356.7000 (29a)
New Flat R	3.2900		3.2900	0.1500	0.4935	9.0000	29.6100 (30)
New Rins@Joists	40.7300		40.7300	0.1100	4.4803	9.0000	366.5700 (30)
Exist. Flat R-TO BE IMPRO.	14.7300		14.7300	0.1800	2.6514	9.0000	132.5700 (30)
Exist.Rins.@Raft.-TO BE IMPRO.	6.5300	0.8500	5.6800	0.1500	0.8520	9.0000	51.1200 (30)

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Total net area of external elements Aum(A, m2)	198.8000												(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	72.6724											(33)
Party Wall 1	18.1300	0.0000	0.0000	180.0000	3263.4000								(32)
Party Floor 1	64.1700			80.0000	5133.6000								(32d)
Internal Wall 1	105.4500			100.0000	10545.0000								(32c)
Internal Floor 1	20.1500			18.0000	362.7000								(32d)
Internal Ceiling 1	20.1500			9.0000	181.3500								(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	36042.1800											(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		427.4452											(35)
Thermal bridges (Default value 0.200 * total exposed area)		39.7600											(36)
Point Thermal bridges		(36a) =	0.0000										
Total fabric heat loss	(33) + (36) + (36a) =	112.4324											(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	38.5652	38.1702	38.3653	37.6138	37.7945	36.7829	37.1008	37.6138	37.2670	37.6138	37.4380	38.1702	(38)
Heat transfer coeff	150.9976	150.6026	150.7977	150.0463	150.2269	149.2153	149.5333	150.0463	149.6994	150.0463	149.8705	150.6026	(39)
Average = Sum(39)m / 12 =												150.1404	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.7908	1.7861	1.7884	1.7795	1.7816	1.7696	1.7734	1.7795	1.7754	1.7795	1.7774	1.7861	(40)
HLP (average)												1.7806	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5397	(42)
Hot water usage for mixer showers														
	91.8538	90.4735	88.4620	84.6133	81.7731	78.6058	76.8055	78.8017	80.9900	84.3908	88.3221	91.5019	91.5019	(42a)
Hot water usage for baths														
	28.8506	28.4221	27.8188	26.7062	25.8732	24.9495	24.4505	25.0497	25.7021	26.6905	27.8259	28.7531	28.7531	(42b)
Hot water usage for other uses														
	40.6395	39.1617	37.6839	36.2061	34.7283	33.2505	33.2505	34.7283	36.2061	37.6839	39.1617	40.6395	40.6395	(42c)
Average daily hot water use (litres/day)													148.3802	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use	161.3439	158.0573	153.9646	147.5256	142.3746	136.8058	134.5065	138.5797	142.8982	148.7651	155.3097	160.8944	160.8944	(44)
Energy conte	255.5293	225.0714	236.6378	201.9552	191.6636	168.2186	162.6739	171.5906	176.2077	201.8729	221.2671	251.9218	251.9218	(45)
Energy content (annual)													2464.6101	
Distribution loss (46)m = 0.15 x (45)m														
	38.3294	33.7607	35.4957	30.2933	28.7495	25.2328	24.4011	25.7386	26.4312	30.2809	33.1901	37.7883	37.7883	(46)
Water storage loss:														
Store volume													150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):													1.3000	(48)
Temperature factor from Table 2b													0.5400	(49)
Enter (49) or (54) in (55)													0.7020	(55)
Total storage loss														
	21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	(56)
If cylinder contains dedicated solar storage														
	21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	(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	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	0.0000	(61)
Total heat required for water heating calculated for each month														
	300.5537	265.7386	281.6622	245.5272	236.6880	211.7906	207.6983	216.6150	219.7797	246.8973	264.8391	296.9462	296.9462	(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														
	300.5537	265.7386	281.6622	245.5272	236.6880	211.7906	207.6983	216.6150	219.7797	246.8973	264.8391	296.9462	296.9462	(64)
Total per year (kWh/year) = Sum(64)m =													2994.7361	(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														
	120.9830	107.3700	114.7016	102.0077	99.7477	90.7903	90.1086	93.0734	93.4467	103.1423	108.4289	119.7835	119.7835	(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	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5														
	37.5967	33.3930	27.1570	20.5596	15.3686	12.9748	14.0197	18.2234	24.4594	31.0568	36.2478	38.6416	38.6416	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5														
	340.6449	344.1797	335.2721	316.3087	292.3709	269.8728	254.8426	251.3078	260.2154	279.1788	303.1166	325.6147	325.6147	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5														
	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	(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	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)														
	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	(71)
Water heating gains (Table 5)														
	162.6116	159.7768	154.1688	141.6774	134.0694	126.0976	121.1137	125.0987	129.7870	138.6321	150.5957	160.9994	160.9994	(72)
Total internal gains														
	644.4261	640.9225	620.1709	582.1187	545.3819	512.5181	493.5490	498.2027	518.0348	552.4405	593.5330	628.8286	628.8286	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	2.0500	12.9236	0.6300	0.7000	0.7700	8.0967 (75)
Southwest	8.7800	40.4699	0.6300	0.7000	0.7700	108.5922 (79)
North	1.3300	11.9814	0.6300	0.7000	0.7700	4.8700 (74)
Northeast	1.4600	12.9236	0.6300	0.7000	0.7700	5.7664 (75)
East	1.3300	22.3313	0.6300	0.7000	0.7700	9.0769 (76)
Southwest	2.0900	40.4699	0.6300	0.7000	0.7700	25.8494 (79)
Northeast	0.8500	19.3863	0.7600	0.7000	1.0000	7.8898 (82)
Solar gains	170.1415	261.1023	388.0205	538.1371	623.9869	684.9564
Total gains	814.5676	902.0248	1008.1914	1120.2558	1169.3688	1197.4745

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	66.3038	66.4777	66.3917	66.7242	66.6440	67.0958	66.9531	66.7242	66.8788	66.7242	66.8025	66.4777
alpha	5.4203	5.4318	5.4261	5.4483	5.4429	5.4731	5.4635	5.4483	5.4586	5.4483	5.4535	5.4318
util living area	0.9979	0.9960	0.9871	0.9511	0.8287	0.5501	0.3241	0.3731	0.7349	0.9624	0.9945	0.9984 (86)
Living	19.8425	19.9571	20.2570	20.6017	20.8804	20.9903	20.9996	20.9991	20.9543	20.6291	20.1741	19.8030
Non living	18.2137	18.3620	18.7389	19.1551	19.4237	19.4901	19.4887	19.4844	19.4761	19.1972	18.6435	18.1658
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	20.4079	19.9571	20.2570	20.6017	20.8804	20.9903	20.9996	20.9991	20.9543	20.6291	20.1741	19.9705 (87)
Th 2	19.4765	19.4798	19.4781	19.4844	19.4829	19.4913	19.4887	19.4844	19.4873	19.4844	19.4859	19.4798 (88)
util rest of house	0.9965	0.9934	0.9779	0.9148	0.7166	0.3717	0.1283	0.1641	0.5567	0.9243	0.9900	0.9974 (89)
MIT 2	18.9731	18.3620	18.7389	19.1551	19.4237	19.4901	19.4887	19.4844	19.4761	19.1972	18.6435	18.4025 (90)
Living area fraction	19.4291	18.8690	19.2214	19.6149	19.8867	19.9669	19.9689	19.9658	19.9459	19.6523	19.1300	0.3178 (91)
MIT	19.4291	18.8690	19.2214	19.6149	19.8867	19.9669	19.9689	19.9658	19.9459	19.6523	19.1300	18.9009 (92)
Temperature adjustment	19.4291	18.8690	19.2214	19.6149	19.8867	19.9669	19.9689	19.9658	19.9459	19.6523	19.1300	0.0000
adjusted MIT	19.4291	18.8690	19.2214	19.6149	19.8867	19.9669	19.9689	19.9658	19.9459	19.6523	19.1300	18.9009 (93)

8. Space heating requirement

Utilisation	0.9964	0.9918	0.9757	0.9188	0.7509	0.4295	0.1907	0.2308	0.6162	0.9301	0.9884	0.9968 (94)
Useful gains	811.6420	894.6682	983.6734	1029.2917	878.0243	514.3332	219.6286	249.8841	614.7951	818.0611	795.0828	769.2438 (95)
Ext temp.	5.5000	5.9000	7.9000	10.4000	13.5000	16.5000	18.5000	18.3000	15.7000	12.1000	8.4000	5.4000 (96)
Heat loss rate W	2103.2600	1953.1594	1707.2489	1382.6554	959.4541	517.3189	219.6494	249.9494	635.6122	1133.1969	1608.1106	2033.2700 (97)
Space heating kWh	960.9638	711.3061	538.3402	254.4219	60.5837	0.0000	0.0000	0.0000	0.0000	234.4611	585.3800	940.4354 (98a)
Space heating requirement - total per year (kWh/year)	960.9638	711.3061	538.3402	254.4219	60.5837	0.0000	0.0000	0.0000	0.0000	234.4611	585.3800	940.4354 (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)	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	960.9638	711.3061	538.3402	254.4219	60.5837	0.0000	0.0000	0.0000	0.0000	234.4611	585.3800	940.4354 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	960.9638	711.3061	538.3402	254.4219	60.5837	0.0000	0.0000	0.0000	0.0000	234.4611	585.3800	940.4354 (98c)
Space heating per m2										(98c) / (4) =		50.8289 (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 %)												348.5117 (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	960.9638	711.3061	538.3402	254.4219	60.5837	0.0000	0.0000	0.0000	0.0000	234.4611	585.3800	940.4354 (98)
Space heating efficiency (main heating system 1)	348.5117	348.5117	348.5117	348.5117	348.5117	0.0000	0.0000	0.0000	0.0000	348.5117	348.5117	348.5117 (210)
Space heating fuel (main heating system)	275.7336	204.0982	154.4683	73.0024	17.3836	0.0000	0.0000	0.0000	0.0000	67.2750	167.9657	269.8433 (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)												

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	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	300.5537	265.7386	281.6622	245.5272	236.6880	211.7906	207.6983	216.6150	219.7797	246.8973	264.8391	296.9462 (64)
Efficiency of water heater												176.7300 (216)
(217)m	176.7300	176.7300	176.7300	176.7300	176.7300	176.7300	176.7300	176.7300	176.7300	176.7300	176.7300	176.7300 (217)
Fuel for water heating, kWh/month	170.0638	150.3642	159.3743	138.9279	133.9263	119.8385	117.5230	122.5683	124.3590	139.7031	149.8552	168.0225 (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	32.9082	26.4001	23.7704	17.4152	13.4520	10.9904	12.2714	15.9508	20.7185	27.1838	30.7040	33.8228 (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												1229.7701 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												176.7300
Water heating fuel used												1694.5261 (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)												265.5876 (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												3189.8839 (238)

10a. Fuel costs - using BEDF prices (521)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1229.7701	18.3900	226.1547 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1694.5261	18.3900	311.6234 (247)
Energy for instantaneous electric shower(s)	0.0000	18.3900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	265.5876	18.3900	48.8416 (250)
Additional standing charges			0.0000 (251)
Total energy cost			586.6196 (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	1229.7701	0.1565	192.4646 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1694.5261	0.1411	239.0485 (264)
Space and water heating			431.5130 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	265.5876	0.1443	38.3325 (268)
Total CO2, kg/year			469.8455 (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	1229.7701	1.5794	1942.3038 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1694.5261	1.5216	2578.4553 (278)

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Space and water heating			4520.7591 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	265.5876	1.5338	407.3672 (282)
Total Primary energy kWh/year			4928.1263 (286)

SAP 10 EPC IMPROVEMENTS

003-be green

Current energy efficiency rating: C 74
Current environmental impact rating: A 95

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
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Total Savings £0 0.00 kg/m²

Potential energy efficiency rating: C 74
Potential environmental impact rating: A 95

Fuel prices for cost data on this page from database revision number 521 TEST (19 Jun 2023)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current £587	Potential £587	Saving £0
Electricity			
Space heating	£226	£226	£0
Water heating	£312	£312	£0
Lighting	£49	£49	£0
Total cost of fuels	£587	£587	£0
Total cost of uses	£587	£587	£0
Delivered energy	38 kWh/m²	38 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.5 tonnes	0.5 tonnes	0.0 tonnes
CO2 emissions per m²	6 kg/m²	6 kg/m²	0 kg/m²
Primary energy	58 kWh/m²	58 kWh/m²	0 kWh/m²

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

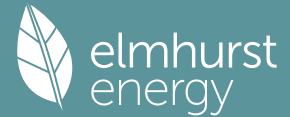
1. Overall dwelling characteristics

	Area (m²)	Storey height (m)	Volume (m³)
Ground floor	64.1700 (1b)	x 2.5000 (2b)	= 160.4250 (1b) -
First floor	20.1500 (1c)	x 2.3600 (2c)	= 47.5540 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.3200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 207.9790 (5)

2. Ventilation rate

	m³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)

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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
 30.0000 / (5) = 0.1442 (8)
 Yes
 Blower Door
 5.0000 (17)
 0.3942 (18)
 2 (19)

Shelter factor
 Infiltration rate adjusted to include shelter factor

(20) = 1 - [0.075 x (19)] = 0.8500 (20)
 (21) = (18) x (20) = 0.3351 (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	0.4273	0.4189	0.4105	0.3686	0.3602	0.3184	0.3184	0.3100	0.3351	0.3602	0.3770	0.3938 (22b)
	0.5913	0.5877	0.5843	0.5679	0.5649	0.5507	0.5507	0.5480	0.5561	0.5649	0.5711	0.5775 (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
New Windows (Uw = 1.40)			10.8300	1.3258	14.3580		(27)
Exist. Windows (Uw = 2.10)			6.2100	1.9373	12.0304		(27)
New D to Corridor			2.0200	1.4000	2.8280		(26)
Opening 9			0.8500	2.8369	2.4113		(27a)
New Unh.W	20.7800	2.0200	18.7600	0.1700	3.1892	150.0000	2814.0000 (29a)
NEW EW	43.4000	6.0900	37.3100	0.1800	6.7158	110.0000	4104.1000 (29a)
Exist.Ext.W-TO BE IMPRO.	29.0800	6.2100	22.8700	0.5500	12.5785	110.0000	2515.7000 (29a)
New Timb. Wall	1.1400		1.1400	0.2000	0.2280	9.0000	10.2600 (29a)
Per. Solid W-TO BE IMPRO.	11.4500		11.4500	0.2600	2.9770	190.0000	2175.5000 (29a)
EW Solid-TO BE IMPRO.	27.6700	4.7400	22.9300	0.3000	6.8790	190.0000	4356.7000 (29a)
New Flat R	3.2900		3.2900	0.1500	0.4935	9.0000	29.6100 (30)
New Rins@Joists	40.7300		40.7300	0.1100	4.4803	9.0000	366.5700 (30)
Exist. Flat R-TO BE IMPRO.	14.7300		14.7300	0.1800	2.6514	9.0000	132.5700 (30)
Exist.Rins.@Raft.-TO BE IMPRO.	6.5300	0.8500	5.6800	0.1500	0.8520	9.0000	51.1200 (30)
Total net area of external elements Aum(A, m2)			198.8000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	72.6724		(33)
Party Wall 1			18.1300	0.0000	0.0000	180.0000	3263.4000 (32)
Party Floor 1			64.1700			80.0000	5133.6000 (32d)
Internal Wall 1			105.4500			100.0000	10545.0000 (32c)
Internal Floor 1			20.1500			18.0000	362.7000 (32d)
Internal Ceiling 1			20.1500			9.0000	181.3500 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 36042.1800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							427.4452 (35)
Thermal bridges (Default value 0.200 * total exposed area)							39.7600 (36)
Point Thermal bridges							(36a) = 0.0000
Total fabric heat loss							(33) + (36) + (36a) = 112.4324 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	40.5812	40.3379	40.0994	38.9795	38.7699	37.7945	37.7945	37.6138	38.1702	38.7699	39.1938	39.6370 (38)
Heat transfer coeff												
	153.0136	152.7703	152.5319	151.4119	151.2024	150.2269	150.2269	150.0463	150.6026	151.2024	151.6263	152.0695 (39)
Average = Sum(39)m / 12 =												151.4109

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.8147	1.8118	1.8090	1.7957	1.7932	1.7816	1.7816	1.7795	1.7861	1.7932	1.7982	1.8035 (40)
HLP (average)												1.7957
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5397 (42)
Hot water usage for mixer showers												
	91.8538	90.4735	88.4620	84.6133	81.7731	78.6058	76.8055	78.8017	80.9900	84.3908	88.3221	91.5019 (42a)
Hot water usage for baths												
	28.8506	28.4221	27.8188	26.7062	25.8732	24.9495	24.4505	25.0497	25.7021	26.6905	27.8259	28.7531 (42b)
Hot water usage for other uses												
	40.6395	39.1617	37.6839	36.2061	34.7283	33.2505	33.2505	34.7283	36.2061	37.6839	39.1617	40.6395 (42c)
Average daily hot water use (litres/day)												148.3802 (43)
Daily hot water use												
	161.3439	158.0573	153.9646	147.5256	142.3746	136.8058	134.5065	138.5797	142.8982	148.7651	155.3097	160.8944 (44)
Energy conte	255.5293	225.0714	236.6378	201.9552	191.6636	168.2186	162.6739	171.5906	176.2077	201.8729	221.2671	251.9218 (45)
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m												2464.6101
	38.3294	33.7607	35.4957	30.2933	28.7495	25.2328	24.4011	25.7386	26.4312	30.2809	33.1901	37.7883 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3000 (48)
Temperature factor from Table 2b												0.5400 (49)

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Enter (49) or (54) in (55)												0.7020 (55)
Total storage loss	21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620 (56)
If cylinder contains dedicated solar storage	21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620 (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	300.5537	265.7386	281.6622	245.5272	236.6880	211.7906	207.6983	216.6150	219.7797	246.8973	264.8391	296.9462 (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	300.5537	265.7386	281.6622	245.5272	236.6880	211.7906	207.6983	216.6150	219.7797	246.8973	264.8391	296.9462 (64)
	Total per year (kWh/year) = Sum(64)m =											2994.7361 (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	120.9830	107.3700	114.7016	102.0077	99.7477	90.7903	90.1086	93.0734	93.4467	103.1423	108.4289	119.7835 (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	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	37.5967	33.3930	27.1570	20.5596	15.3686	12.9748	14.0197	18.2234	24.4594	31.0568	36.2478	38.6416	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.6449	344.1797	335.2721	316.3087	292.3709	269.8728	254.8426	251.3078	260.2154	279.1788	303.1166	325.6147	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	(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)	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	(71)
Water heating gains (Table 5)	162.6116	159.7768	154.1688	141.6774	134.0694	126.0976	121.1137	125.0987	129.7870	138.6321	150.5957	160.9994	(72)
Total internal gains	644.4261	640.9225	620.1709	582.1187	545.3819	512.5181	493.5490	498.2027	518.0348	552.4405	593.5330	628.8286	(73)

6. Solar gains

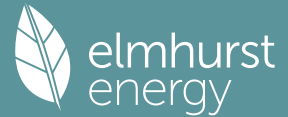
[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	2.0500	11.2829	0.6300	0.7000	0.7700	7.0688 (75)
Southwest	8.7800	36.7938	0.6300	0.7000	0.7700	98.7282 (79)
North	1.3300	10.6334	0.6300	0.7000	0.7700	4.3221 (74)
Northeast	1.4600	11.2829	0.6300	0.7000	0.7700	5.0344 (75)
East	1.3300	19.6403	0.6300	0.7000	0.7700	7.9831 (76)
Southwest	2.0900	36.7938	0.6300	0.7000	0.7700	23.5014 (79)
Northeast	0.8500	16.8560	0.7600	0.7000	1.0000	6.8601 (82)

Solar gains	153.4981	270.9425	395.4277	530.6177	630.9030	642.2787	612.6033	535.4462	441.9273	306.1571	185.5927	130.2321 (83)
Total gains	797.9242	911.8650	1015.5986	1112.7363	1176.2849	1154.7968	1106.1523	1033.6490	959.9621	858.5976	779.1257	759.0607 (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, n _{l,m} (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	65.4302	65.5344	65.6369	66.1224	66.2140	66.6440	66.6440	66.7242	66.4777	66.2140	66.0289	65.8365
alpha	5.3620	5.3690	5.3758	5.4082	5.4143	5.4429	5.4429	5.4483	5.4318	5.4143	5.4019	5.3891
util living area	0.9987	0.9969	0.9917	0.9724	0.9088	0.7584	0.5824	0.6412	0.8760	0.9825	0.9971	0.9990 (86)
Living	19.6710	19.8278	20.0891	20.4320	20.7446	20.9350	20.9873	20.9792	20.8497	20.4478	19.9925	19.6407
Non living	17.9824	18.1839	18.5169	18.9476	19.2969	19.4596	19.4813	19.4813	19.4061	18.9766	18.4020	17.9491
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	20.3201	19.8278	20.0891	20.4320	20.7446	20.9350	20.9873	20.9792	20.8497	20.4478	19.9925	19.8308 (87)
Th 2	19.4597	19.4618	19.4637	19.4730	19.4748	19.4829	19.4829	19.4844	19.4798	19.4748	19.4712	19.4676 (88)
util rest of house	0.9979	0.9951	0.9863	0.9528	0.8438	0.6145	0.3901	0.4446	0.7651	0.9660	0.9949	0.9984 (89)
MIT 2	18.8708	18.1839	18.5169	18.9476	19.2969	19.4596	19.4813	19.4813	19.4061	18.9766	18.4020	18.2227 (90)
Living area fraction	fLA = Living area / (4) = 0.3178 (91)											
MIT	19.3314	18.7064	19.0166	19.4194	19.7570	19.9285	19.9600	19.9574	19.8649	19.4442	18.9075	18.7338 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.3314	18.7064	19.0166	19.4194	19.7570	19.9285	19.9600	19.9574	19.8649	19.4442	18.9075	18.7338 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9978	0.9937	0.9840	0.9518	0.8585	0.6612	0.4528	0.5095	0.7992	0.9655	0.9937	0.9979	(94)
Useful gains	796.1370	906.1000	999.3355	1059.1432	1009.8410	763.5915	500.8992	526.6186	767.1800	828.9600	774.1851	757.4878	(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	2300.0129	2109.2115	1909.1820	1592.7580	1218.2424	800.4906	504.7596	533.7676	868.2094	1337.2631	1790.3246	2210.1508	(97)
Space heating kWh	1118.8836	808.4909	676.9258	384.2026	155.0506	0.0000	0.0000	0.0000	0.0000	378.1775	731.6204	1080.7812	(98a)
Space heating requirement - total per year (kWh/year)												5334.1327	
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	1118.8836	808.4909	676.9258	384.2026	155.0506	0.0000	0.0000	0.0000	0.0000	378.1775	731.6204	1080.7812	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5334.1327	
Space heating per m2										(98c) / (4) =		63.2606	(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 %)													348.8278 (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	1118.8836	808.4909	676.9258	384.2026	155.0506	0.0000	0.0000	0.0000	0.0000	378.1775	731.6204	1080.7812	(98)
Space heating efficiency (main heating system 1)	348.8278	348.8278	348.8278	348.8278	348.8278	0.0000	0.0000	0.0000	0.0000	348.8278	348.8278	348.8278	(210)
Space heating fuel (main heating system)	320.7553	231.7737	194.0573	110.1411	44.4490	0.0000	0.0000	0.0000	0.0000	108.4138	209.7369	309.8323	(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	300.5537	265.7386	281.6622	245.5272	236.6880	211.7906	207.6983	216.6150	219.7797	246.8973	264.8391	296.9462	(64)
Efficiency of water heater (217)m	176.7788	176.7788	176.7788	176.7788	176.7788	176.7788	176.7788	176.7788	176.7788	176.7788	176.7788	176.7788	(216)
Fuel for water heating, kWh/month	170.0168	150.3227	159.3303	138.8895	133.8893	119.8054	117.4905	122.5345	124.3247	139.6645	149.8138	167.9761	(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	32.9082	26.4001	23.7704	17.4152	13.4520	10.9904	12.2714	15.9508	20.7185	27.1838	30.7040	33.8228	(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												1529.1594	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												176.7788	
Water heating fuel used												1694.0582	(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)												265.5876	(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												3488.8053	(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	1529.1594	16.4900	252.1584 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1694.0582	16.4900	279.3502 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	265.5876	16.4900	43.7954 (250)
Additional standing charges			0.0000 (251)
Total energy cost			575.3040 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.6015 (257)
SAP value		74.0393
SAP rating (Section 12)		74 (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	1529.1594	0.1554	237.5923 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1694.0582	0.1411	238.9824 (264)
Space and water heating			476.5748 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	265.5876	0.1443	38.3325 (268)
Total CO2, kg/year			514.9073 (272)
CO2 emissions per m2			6.1100 (273)
EI value			94.6646
EI rating			95 (274)
EI band			A

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

1. Overall dwelling characteristics

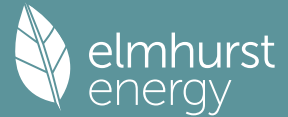
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	64.1700 (1b)	x 2.5000 (2b)	= 160.4250 (1b) -
First floor	20.1500 (1c)	x 2.3600 (2c)	= 47.5540 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.3200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	207.9790 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1442 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			5.0000 (17)

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Infiltration rate												0.3942 (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) = 0.3351 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.2000	4.0000	4.1000	3.7000	3.8000	3.2000	3.4000	3.7000	3.5000	3.7000	3.6000	4.0000 (22)
Adj infiltr rate	1.0500	1.0000	1.0250	0.9250	0.9500	0.8000	0.8500	0.9250	0.8750	0.9250	0.9000	1.0000 (22a)
Effective ac	0.3519	0.3351	0.3435	0.3100	0.3184	0.2681	0.2848	0.3100	0.2932	0.3100	0.3016	0.3351 (22b)
	0.5619	0.5561	0.5590	0.5480	0.5507	0.5359	0.5406	0.5480	0.5430	0.5480	0.5455	0.5561 (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
New Windows (Uw = 1.40)			10.8300	1.3258	14.3580		(27)
Exist. Windows (Uw = 2.10)			6.2100	1.9373	12.0304		(27)
New D to Corridor			2.0200	1.4000	2.8280		(26)
Opening 9			0.8500	2.8369	2.4113		(27a)
New Unh.W	20.7800	2.0200	18.7600	0.1700	3.1892	150.0000	2814.0000 (29a)
NEW EW	43.4000	6.0900	37.3100	0.1800	6.7158	110.0000	4104.1000 (29a)
Exist.Ext.W-TO BE IMPRO.	29.0800	6.2100	22.8700	0.5500	12.5785	110.0000	2515.7000 (29a)
New Timb. Wall	1.1400		1.1400	0.2000	0.2280	9.0000	10.2600 (29a)
Per. Solid W-TO BE IMPRO.	11.4500		11.4500	0.2600	2.9770	190.0000	2175.5000 (29a)
EW Solid-TO BE IMPRO.	27.6700	4.7400	22.9300	0.3000	6.8790	190.0000	4356.7000 (29a)
New Flat R	3.2900		3.2900	0.1500	0.4935	9.0000	29.6100 (30)
New Rins@Joists	40.7300		40.7300	0.1100	4.4803	9.0000	366.5700 (30)
Exist. Flat R-TO BE IMPRO.	14.7300		14.7300	0.1800	2.6514	9.0000	132.5700 (30)
Exist.Rins.@Raft.-TO BE IMPRO.	6.5300	0.8500	5.6800	0.1500	0.8520	9.0000	51.1200 (30)
Total net area of external elements Aum(A, m2)			198.8000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	72.6724		(33)
Party Wall 1			18.1300	0.0000	0.0000	180.0000	3263.4000 (32)
Party Floor 1			64.1700			80.0000	5133.6000 (32d)
Internal Wall 1			105.4500			100.0000	10545.0000 (32c)
Internal Floor 1			20.1500			18.0000	362.7000 (32d)
Internal Ceiling 1			20.1500			9.0000	181.3500 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	36042.1800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							427.4452 (35)
Thermal bridges (Default value 0.200 * total exposed area)							39.7600 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	112.4324 (37)

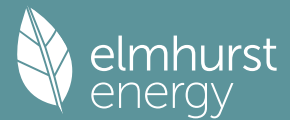
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	38.5652	38.1702	38.3653	37.6138	37.7945	36.7829	37.1008	37.6138	37.2670	37.6138	37.4380	38.1702 (38)
Average = Sum(39)m / 12 =	150.9976	150.6026	150.7977	150.0463	150.2269	149.2153	149.5333	150.0463	149.6994	150.0463	149.8705	150.6026 (39)
	150.1404											150.1404
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.7908	1.7861	1.7884	1.7795	1.7816	1.7696	1.7734	1.7795	1.7754	1.7795	1.7774	1.7861 (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												2.5397 (42)
Hot water usage for mixer showers												91.8538 90.4735 88.4620 84.6133 81.7731 78.6058 76.8055 78.8017 80.9900 84.3908 88.3221 91.5019 (42a)
Hot water usage for baths												28.8506 28.4221 27.8188 26.7062 25.8732 24.9495 24.4505 25.0497 25.7021 26.6905 27.8259 28.7531 (42b)
Hot water usage for other uses												40.6395 39.1617 37.6839 36.2061 34.7283 33.2505 33.2505 34.7283 36.2061 37.6839 39.1617 40.6395 (42c)
Average daily hot water use (litres/day)												148.3802 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	161.3439	158.0573	153.9646	147.5256	142.3746	136.8058	134.5065	138.5797	142.8982	148.7651	155.3097	160.8944 (44)
Energy content (annual)	255.5293	225.0714	236.6378	201.9552	191.6636	168.2186	162.6739	171.5906	176.2077	201.8729	221.2671	251.9218 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 2464.6101
Water storage loss:	38.3294	33.7607	35.4957	30.2933	28.7495	25.2328	24.4011	25.7386	26.4312	30.2809	33.1901	37.7883 (46)
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7020 (55)
Total storage loss	21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620 (56)
If cylinder contains dedicated solar storage	21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620 (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)

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Total heat required for water heating calculated for each month

	300.5537	265.7386	281.6622	245.5272	236.6880	211.7906	207.6983	216.6150	219.7797	246.8973	264.8391	296.9462 (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	300.5537	265.7386	281.6622	245.5272	236.6880	211.7906	207.6983	216.6150	219.7797	246.8973	264.8391	296.9462 (64)
	Total per year (kWh/year) = Sum(64)m =											2994.7361 (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	120.9830	107.3700	114.7016	102.0077	99.7477	90.7903	90.1086	93.0734	93.4467	103.1423	108.4289	119.7835 (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	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	152.3843	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	37.5967	33.3930	27.1570	20.5596	15.3686	12.9748	14.0197	18.2234	24.4594	31.0568	36.2478	38.6416	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	340.6449	344.1797	335.2721	316.3087	292.3709	269.8728	254.8426	251.3078	260.2154	279.1788	303.1166	325.6147	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	52.7782	(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)	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	-101.5895	(71)
Water heating gains (Table 5)	162.6116	159.7768	154.1688	141.6774	134.0694	126.0976	121.1137	125.0987	129.7870	138.6321	150.5957	160.9994	(72)
Total internal gains	644.4261	640.9225	620.1709	582.1187	545.3819	512.5181	493.5490	498.2027	518.0348	552.4405	593.5330	628.8286	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	2.0500	12.9236	0.6300	0.7000	0.7700	8.0967 (75)
Southwest	8.7800	40.4699	0.6300	0.7000	0.7700	108.5922 (79)
North	1.3300	11.9814	0.6300	0.7000	0.7700	4.8700 (74)
Northeast	1.4600	12.9236	0.6300	0.7000	0.7700	5.7664 (75)
East	1.3300	22.3313	0.6300	0.7000	0.7700	9.0769 (76)
Southwest	2.0900	40.4699	0.6300	0.7000	0.7700	25.8494 (79)
Northeast	0.8500	19.3863	0.7600	0.7000	1.0000	7.8898 (82)

Solar gains	170.1415	261.1023	388.0205	538.1371	623.9869	684.9564	658.3356	584.4655	479.6832	327.1355	210.8514	142.9023 (83)
Total gains	814.5676	902.0248	1008.1914	1120.2558	1169.3688	1197.4745	1151.8846	1082.6682	997.7179	879.5760	804.3844	771.7309 (84)

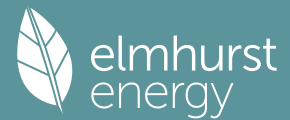
7. Mean internal temperature (heating season)

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	66.3038	66.4777	66.3917	66.7242	66.6440	67.0958	66.9531	66.7242	66.8788	66.7242	66.8025	66.4777
alpha	5.4203	5.4318	5.4261	5.4483	5.4429	5.4731	5.4635	5.4483	5.4586	5.4483	5.4535	5.4318
util living area	0.9979	0.9960	0.9871	0.9511	0.8287	0.5501	0.3241	0.3731	0.7349	0.9624	0.9945	0.9984 (86)
Living	19.8425	19.9571	20.2570	20.6017	20.8804	20.9903	20.9996	20.9991	20.9543	20.6291	20.1741	19.8030
Non living	18.2137	18.3620	18.7389	19.1551	19.4237	19.4901	19.4887	19.4844	19.4761	19.1972	18.6435	18.1658
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	20.4079	19.9571	20.2570	20.6017	20.8804	20.9903	20.9996	20.9991	20.9543	20.6291	20.1741	19.9705 (87)
Th 2	19.4765	19.4798	19.4781	19.4844	19.4829	19.4913	19.4887	19.4844	19.4873	19.4844	19.4859	19.4798 (88)
util rest of house	0.9965	0.9934	0.9779	0.9148	0.7166	0.3717	0.1283	0.1641	0.5567	0.9243	0.9900	0.9974 (89)
MIT 2	18.9731	18.3620	18.7389	19.1551	19.4237	19.4901	19.4887	19.4844	19.4761	19.1972	18.6435	18.4025 (90)
Living area fraction	fLA = Living area / (4) =											0.3178 (91)
MIT	19.4291	18.8690	19.2214	19.6149	19.8867	19.9669	19.9689	19.9658	19.9459	19.6523	19.1300	18.9009 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4291	18.8690	19.2214	19.6149	19.8867	19.9669	19.9689	19.9658	19.9459	19.6523	19.1300	18.9009 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9964	0.9918	0.9757	0.9188	0.7509	0.4295	0.1907	0.2308	0.6162	0.9301	0.9884	0.9968 (94)

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Useful gains	811.6420	894.6682	983.6734	1029.2917	878.0243	514.3332	219.6286	249.8841	614.7951	818.0611	795.0828	769.2438 (95)
Ext temp.	5.5000	5.9000	7.9000	10.4000	13.5000	16.5000	18.5000	18.3000	15.7000	12.1000	8.4000	5.4000 (96)
Heat loss rate W	2103.2600	1953.1594	1707.2489	1382.6554	959.4541	517.3189	219.6494	249.9494	635.6122	1133.1969	1608.1106	2033.2700 (97)
Space heating kWh	960.9638	711.3061	538.3402	254.4219	60.5837	0.0000	0.0000	0.0000	0.0000	234.4611	585.3800	940.4354 (98a)
Space heating requirement - total per year (kWh/year)												4285.8921
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	960.9638	711.3061	538.3402	254.4219	60.5837	0.0000	0.0000	0.0000	0.0000	234.4611	585.3800	940.4354 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4285.8921
Space heating per m2										(98c) / (4) =		50.8289 (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 %)												348.5117 (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	960.9638	711.3061	538.3402	254.4219	60.5837	0.0000	0.0000	0.0000	0.0000	234.4611	585.3800	940.4354 (98)
Space heating efficiency (main heating system 1)	348.5117	348.5117	348.5117	348.5117	348.5117	0.0000	0.0000	0.0000	0.0000	348.5117	348.5117	348.5117 (210)
Space heating fuel (main heating system)	275.7336	204.0982	154.4683	73.0024	17.3836	0.0000	0.0000	0.0000	0.0000	67.2750	167.9657	269.8433 (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	300.5537	265.7386	281.6622	245.5272	236.6880	211.7906	207.6983	216.6150	219.7797	246.8973	264.8391	296.9462 (64)
Efficiency of water heater (217)m	176.7300	176.7300	176.7300	176.7300	176.7300	176.7300	176.7300	176.7300	176.7300	176.7300	176.7300	176.7300 (216)
Fuel for water heating, kWh/month	170.0638	150.3642	159.3743	138.9279	133.9263	119.8385	117.5230	122.5683	124.3590	139.7031	149.8552	168.0225 (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	32.9082	26.4001	23.7704	17.4152	13.4520	10.9904	12.2714	15.9508	20.7185	27.1838	30.7040	33.8228 (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												1229.7701 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												176.7300
Water heating fuel used												1694.5261 (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)												265.5876 (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												3189.8839 (238)

10a. Fuel costs - using BEDF prices (521)

Fuel Fuel price Fuel cost

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	kWh/year	p/kWh	£/year
Space heating - main system 1	1229.7701	18.3900	226.1547 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1694.5261	18.3900	311.6234 (247)
Energy for instantaneous electric shower(s)	0.0000	18.3900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	265.5876	18.3900	48.8416 (250)
Additional standing charges			0.0000 (251)
Total energy cost			586.6196 (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	1229.7701	0.1565	192.4646 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1694.5261	0.1411	239.0485 (264)
Space and water heating			431.5130 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	265.5876	0.1443	38.3325 (268)
Total CO2, kg/year			469.8455 (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	1229.7701	1.5794	1942.3038 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1694.5261	1.5216	2578.4553 (278)
Space and water heating			4520.7591 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	265.5876	1.5338	407.3672 (282)
Total Primary energy kWh/year			4928.1263 (286)

Summary for Input Data

Property Reference	Flat 02-116 Norfolk Avenue	Issued on Date	30/06/2023
Assessment Reference	003-be green	Prop Type Ref	PR10687
Property	116, Norfolk Avenue, London, N13 6AJ		

SAP Rating	74 C	DER		TER	
Environmental	95 A	% DER < TER			N/A
CO ₂ Emissions (t/year)	0.47	DFEE		TFEE	
Compliance Check	See BREL	% DFEE < TFEE			
% DPER < TPER		DPER		TPER	

Assessor Details	Mr. Nikolas Koutsorizof	Assessor ID	U127-0001
Client	-, Chris Georgiou		

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	Northwest
Property Tenure	ND
Transaction Type	5
Terrain Type	Suburban
1.0 Property Type	Flat, End-Terrace
Position of Flat	Top-floor flat
Which Floor	1
2.0 Number of Storeys	2
3.0 Date Built	2023
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown
6.0 Thermal Mass Parameter	Precise calculation
7.0 Electricity Tariff	Standard
Smart electricity meter fitted	Yes
Smart gas meter fitted	Yes

7.0 Measurements		Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground floor:	37.30 m	64.17 m ²	2.50 m
	1st Storey:	1.00 m	20.15 m ²	2.36 m

8.0 Living Area	26.80	m ²
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Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area(m ²)	Nett Area (m ²)	Shelter Res	Shelter	Openings	Area Calculation Type
New Unh.W	Solid Wall	Solid wall : plasterboard on dabs, 200 mm dense block, insulated externally	0.20	150.00	20.78	18.76	0.82	Stairwell	2.02	Enter Gross Area
NEW EW	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.18	110.00	43.40	37.31	0.00	None	6.09	Enter Gross Area
Exist.Ext.W-TO BE IMPRO.	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.55	110.00	29.08	22.88	0.00	None	6.20	Enter Gross Area
New Timb. Wall	Timber Frame	Timber framed wall (one layer of plasterboard)	0.20	9.00	1.14	1.14	0.00	None	0.00	Enter Gross Area
Per. Solid W-TO BE IMPRO.	Solid Wall	Solid wall : dense plaster, 200 mm dense block, insulated externally	0.30	190.00	11.45	11.45	0.50	Room In Roof	0.00	Enter Gross Area
EW Solid-TO BE IMPRO.	Solid Wall	Solid wall : dense plaster, 200 mm dense block, insulated externally	0.30	190.00	27.67	22.93	0.00	None	4.74	Enter Gross Area

Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Dense plaster both sides, dense blocks, cavity or cavity fill	0.00	180.00	18.13		None

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Internal Wall 1	Dense block, dense plaster	100.00	105.45

Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area(m ²)	Nett Area	Shelter Code	Shelter Factor	Calculation	Openings
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Summary for Input Data

New Flat R	External Flat Roof	Plasterboard, insulated flat roof	0.15	9.00	3.29	(m ²) 0.00	None	0.00	Enter Gross Area	0.00
New Rins@Joists	External Plane Roof	Plasterboard, insulated at ceiling level	0.11	9.00	40.73	0.00	None	0.00	Enter Gross Area	0.00
Exist. Flat R-TO BE IMPRO.	External Flat Roof	Plasterboard, insulated flat roof	0.18	9.00	14.73	0.00	None	0.00	Enter Gross Area	0.00
Exist.Rins.@Raft.-TO BE IMPRO.	External Slope Roof	Plasterboard, insulated slope	0.15	9.00	6.53	0.85	None	0.00	Enter Gross Area	0.85

10.2 Internal Ceilings

Description	Storey	Construction	Area (m ²)
Internal Ceiling 1	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	20.15

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m ² K)	Area (m ²)
Party Floor 1	+1	Concrete floor slab, carpeted	100.00	64.17

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m ² K)	Area (m ²)
Internal Floor 1		Plasterboard ceiling, carpeted chipboard floor	9.00	20.15

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m ² K)
New Windows	Manufacturer	Window	Double Low-E Soft 0.1			0.63		0.70	1.40
Exist. Windows	SAP table	Window	Double Low-E Soft 0.1	12 mm	None	0.63	PVC	0.70	2.10
New D to Corridor	SAP table	Door to Corridor							1.40
Exist. RL	SAP table	Roof Window	Double glazed	12 mm	None	0.76	PVC	0.70	2.80

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m ²)	Pitch
Opening 1	New D to Corridor	New Unh.W	North West	2.02	
Opening 2	Exist. Windows	Exist.Ext.W-TO BE IMPRO.	North East	1.46	
Opening 3	Exist. Windows	Exist.Ext.W-TO BE IMPRO.	North	1.33	
Opening 4	Exist. Windows	Exist.Ext.W-TO BE IMPRO.	East	1.33	
Opening 5	New Windows	NEW EW	North East	2.05	
Opening 6	Exist. Windows	Exist.Ext.W-TO BE IMPRO.	South West	2.09	
Opening 7	New Windows	NEW EW	South West	4.04	
Opening 8	New Windows	EW Solid-TO BE IMPRO.	South West	4.74	
Opening 9	Exist. RL	Exist.Rins.@Raft.-TO BE IMPRO.	North East	0.85	40

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

Y-value

 W/m²K

18.0 Pressure Testing

Designed AP₅₀
 m³/(h.m²) @ 50 Pa

Property Tested?

Test Method

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System

22.0 Lighting

No Fixed Lighting

Name	Efficacy	Power	Capacity	Count
Low energy Lighting	75.00	2	150	12

24.0 Main Heating 1

Percentage of Heat

 %

Database Ref. No.

Fuel Type

Summary for Input Data

In Winter	0.00
In Summer	0.00
Model Name	Ecodan 8.5 kW
Manufacturer	Mitsubishi Electric Europe B.V.
System Type	Heat Pump
Controls SAP Code	2207
PCDF Controls	0
Is MHS Pumped	Pump in heated space
Heating Pump Age	2013 or later
Heat Emitter	Radiators
Flow Temperature	Enter value
Flow Temperature Value	35.00

25.0 Main Heating 2	None
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26.0 Heat Networks	None
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Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1									
Heat source 2									
Heat source 3									
Heat source 4									
Heat source 5									

28.0 Water Heating	
Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	2
Immersion Only Heating Hot Water	No

28.1 Showers							
Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To		

28.3 Waste Water Heat Recovery System	
---------------------------------------	--

29.0 Hot Water Cylinder	Hot Water Cylinder						
Cylinder Stat	Yes						
Cylinder In Heated Space	Yes						
Independent Time Control	Yes						
Insulation Type	Measured Loss						
Cylinder Volume	150.00					L	
Loss	1.30					kWh/day	
Pipes insulation	Fully insulated primary pipework						
In Airing Cupboard	No						

31.0 Thermal Store	None
--------------------	------

34.0 Small-scale Hydro	None
------------------------	------

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

Summary for Input Data



Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

Typical Cost	Typical savings per year	Ratings after improvement	
		SAP rating	Environmental Impact
		0	0
		0	0
		0	0

Overview Report

Dwelling Address	116, Norfolk Avenue, London, N13 6AJ
Report Date	30/06/2023
Property Type	Flat, End-Terrace
Floor Area [m ²]	84

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

Energy Rating

The current energy rating represents the overall energy efficiency of the dwelling. The potential energy rating is the overall energy rating of the dwelling after all of the recommend measures provided on the next page have been installed. A higher score represents a more energy efficient dwelling with lower fuel bills.

Most energy efficient - lower running costs

CURRENT

POTENTIAL

(92 plus)

A

(81-91)

B

(69-80)

C

(55-68)

D

(39-54)

E

(21-38)

F

(1-20)

G

74

74

Least energy efficient - higher running costs

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good
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Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.28 W/m ² K	Good
Roof	Average thermal transmittance 0.13 W/m ² K	Very Good
Windows	Fully double glazed	Average
Main heating	Air source heat pump, radiators, electric	Very Good
Main heating controls	Time and temperature zone control	Very Good
Secondary heating	None	
Hot water	From main system	Average
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 5.0 m ³ /h.m ² (assumed)	Good

Primary Energy use

The primary energy use for this property per year is 58 kilowatt hour (kWh) per square metre

Estimated CO₂ emissions of the dwelling

The estimated CO rating provides an indication of the dwelling's impact on the environment in terms of carbon dioxide emissions; the higher the rating the less impact it has on the environment.

The estimated CO emissions for this dwellings is: **0.5** per year

With the recommended measures the potential CO emissions could be: **0** per year

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling. To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed. Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measure	Typical Yearly Saving	Potential Rating after measure installed	Cumulative savings (per year)	Cumulative Potential Rating
---------------------	-----------------------	--	-------------------------------	-----------------------------

Estimated energy use and potential savings

Estimated energy cost for this property over a year

£587

Over a year you could save

£0

The estimated cost and savings show how much the average household would spend in this property for heating, lighting and hot water. It is not based on how energy is used by the people living at the property.

Contacting the assessor and the accreditation scheme

Assessor contact details	
Assessor name	Mr. Nikolas Koutsorizof
Assessor's accreditation number	
Email Address	

Accreditation scheme contact details

Accreditation scheme	
Telephone	
Email Address	

Assessment details

Related party disclosure	
Date of assessment	30/06/2023
Date of certificate	30/06/2023
Type of assessment	SAP, existing dwelling



Job no:

Date:

Assessor name:

Registration no:

Development name:

PRXXXX

XX/XX/XXXX

Rajohn Ali

BRE400012

Appendix of Energy Statement

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PRINTING: before printing please make sure that in "Page Setup" you have selected the page to be as "Landscape" and that the Scale has been set up to 70% (maximum)

Water Efficiency Calculator for New Dwellings - (Basic Calculator)																									
		House Type:	Type 1		Type 2		Type 3		Type 4		Type 5		Type 6		Type 7		Type 8		Type 9		Type 10				
		Description:	Dwelling																						
Installation Type	Unit of measure	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day				
Is a dual or single flush WC specified?			Dual																						
WC	Full flush volume	6	8.76		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00				
	Part flush volume	3	8.88		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00				
Taps (excluding kitchen and external taps)	Flow rate (litres / minute)	6	11.06		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00				
Are both a Bath & Shower Present?			Bath & Shower																						
Bath	Capacity to overflow	155	17.05		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00				
Shower	Flow rate (litres / minute)	8	34.96		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00				
Kitchen sink taps	Flow rate (litres / minute)	6	13.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00				
Has a washing machine been specified?			No																						
Washing Machine	Litres / kg	7	17.16		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00				
Has a dishwasher been specified?			No																						
Dishwasher	Litres / place setting	0.9	4.50		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00				
Has a waste disposal unit been specified?			No																						
Water Softener	Litres / person / day		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00				
Calculated Use			115.4		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0				
Normalisation factor			0.91		0.91		0.91		0.91		0.91		0.91		0.91		0.91		0.91		0.91	0.91	0.91	0.91	0.91
Code for Sustainable Homes	Total Consumption		105.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0				
	Mandatory level		Level 3/4		-		-		-		-		-		-		-		-		-	-	-	-	-
Building Regulations 17.K	External use		5.0		5.0		5.0		5.0		5.0		5.0		5.0		5.0		5.0		5.0				
	Total Consumption		110.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	0.0	0.0	0.0	0.0
	17.K Compliance?		Yes		-		-		-		-		-		-		-		-		-	-	-	-	-