

Highmoor Lane, CLECKHEATON, BD19 6LW

**Energy Statement
&
Regulation 25a Low or Zero Carbon (LZC) technology feasibility
study**

AG-78831-LZCR-Rev A

7th May 2024

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1. Executive Summary

This report has considered the use of high efficiency alternative heating systems in line with the requirements of Regulation 25a, Approved Document Part L Volume 1 of the building regulations (England) 2021.

The proposed fabric and mechanical specification from Table 2 and Table 3 shown on page 6 of this report will achieve a compliance with AD. L1 2021 building regulations of which fabric and PV technology will provide the following reductions in energy, primary energy over and above the requirements of Part L 2021 and a 35.41% reduction in Carbon emissions over and above AD. L1 2013 requirements (Regulated use).

Regulated use

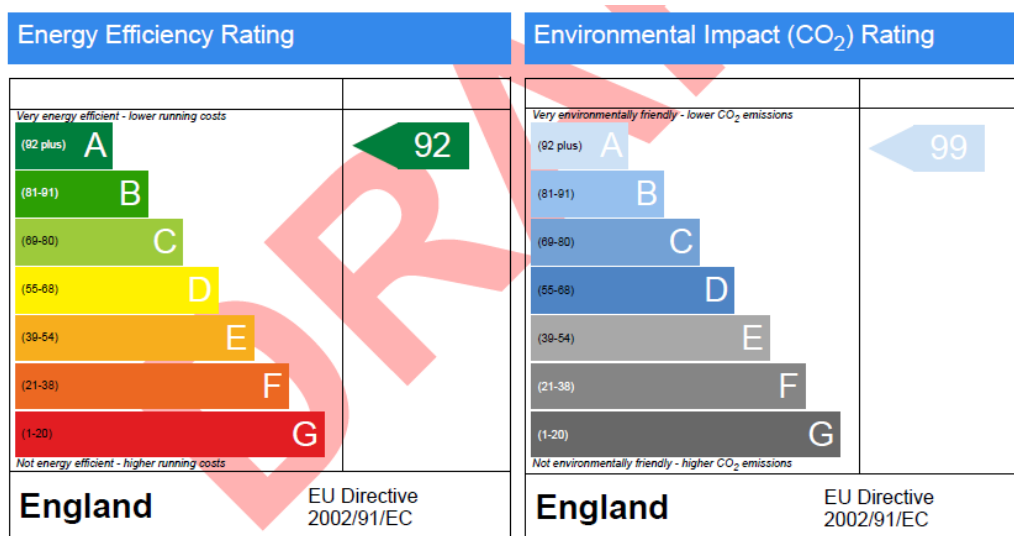
Energy (Consumption)	-2.77%
Primary Energy (Total energy)	0.45%
Carbon emissions	1.09% (AD. Part L1 2021)
Carbon emissions	32.09% (AD. Part L1 2013)

Total use

Energy (Consumption)	-1.50%
Primary Energy (Total energy)	1.47%
Carbon emissions	0.74%

Proposed Solution

The proposed solution is to adopt a “Fabric First” approach (Be Lean) and use high efficient gas boilers and Photovoltaic technology (Be Green) to meet the regulatory requirements of Approved Document Part L Volume 1 of the Building Regulations 2021. Photovoltaic technology has been chosen to reduce running costs and achieve an Energy Performance Certificate “Energy Efficiency” “A” rating and “Environmental Impact” “A” rating

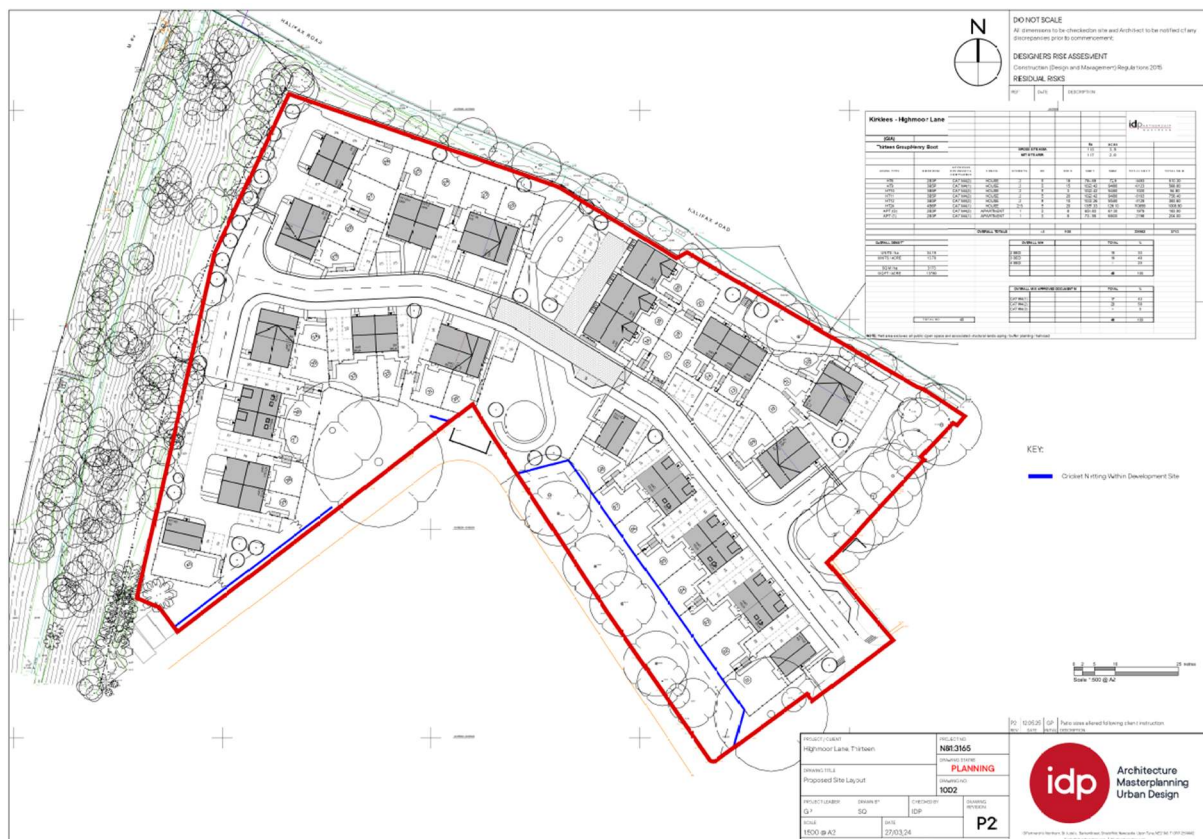


The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

2. The development

The residential development at Highmoor Lane, CLECKHEATON, BD19 6LW will comprises a total of 40 dwellings which are to achieve compliance with approved document Part L1 of the building regulations 2021.



2.1. Housing mix

House types	Number	Area m ²	Total area m ²
House Type 6	7	72.90	510.30
House Type 9	6	94.80	568.80
House Type 10	1	94.80	94.80
House Type 11	8	94.80	758.40
House Type 12	4	95.90	383.60
House Type 24	8	126.10	1008.80
APT (G)	3	61.30	183.90
APT (1)	3	68.00	204.00
Total	40		3712.60

2.2. Proposed specification & assessment

The objective of this section of the report is to provide more information on specific requirements and details of the proposed fabric and heating and solutions, from this initial assessment and specific technical requirements a detailed heating design will need to be provided by a specialist who may be required to work with manufacturers. Technical information from the manufacturers will be included as an Appendix to this main report when available.

Table 2: Proposed fabric specification

Roof	0.09	W/m ² K
Walls	0.18	W/m ² K
Floor	0.11	W/m ² K
Windows	1.20	W/m ² K
Doors	1.00	W/m ² K

Thermal Bridging	Modelled Thermal bridging details, assessment based on R2 Values
Air permeability	4.00 m ²

Table 3: Mechanical Specification

Heating	Vaillant ecoTEC Sustain
Controls	Time and Temperature Zone Control
Domestic Hot Water	From main system
Compensator	Delayed start thermostat
Ventilation	Decentralised, Mechanical Extract Ventilation dMEV
Lighting	80lumes / watt
Photovoltaic Panels	PV panels installed to all dwellings as per estimate below

Photovoltaic estimate, Kw Peak

Estimate of PV requirements to achieve a minimum Energy Performance Certificate Rating of "A" based on 400watt panels																	
Property details				System 1					Property details				System 1				
Plot N°	House Type	Front Orient	Det	Orient	Pitch	No Panels	Panel size (Watts)	PV Kw Peak (Kw)	Plot N°	House Type	Front Orient	Det	Orient	Pitch	No Panels	Panel size (Watts)	PV Kw Peak (Kw)
1	11	SE	Det	SE	45	7	400	2.80	21	APT	NW	Flat	SE	30	4	400	1.60
2	24	NE	Semi	SW	30	7	400	2.80	22	11	SE	Semi	SE	45	7	400	2.80
3	24	NE	Semi	SW	30	7	400	2.80	23	9	SE	Semi	SE	30	6	400	2.40
4	24	NE	Semi	SW	30	7	400	2.80	24	12	SE	Semi	SE	30	6	400	2.40
5	24	NE	Semi	SW	30	7	400	2.80	25	12	SE	Semi	SE	30	6	400	2.40
6	24	NE	Semi	SW	30	7	400	2.80	26	6	NE	Semi	SW	30	5	400	2.00
7	24	NE	Semi	SW	30	7	400	2.80	27	6	NE	Semi	SW	30	5	400	2.00
8	11	SE	Det	SE	45	7	400	2.80	28	9	NE	Semi	SW	30	6	400	2.40
9	11	SE	Semi	SE	30	7	400	2.80	29	11	SW	Semi	SW	45	7	400	2.80
10	9	SE	Semi	SE	30	6	400	2.40	30	11	NE	Semi	SE	45	7	400	2.80
11	9	SE	Semi	SE	30	6	400	2.40	31	9	NE	Semi	SW	30	6	400	2.40
12	11	SE	Semi	SE	30	7	400	2.80	32	6	North	Semi	South	30	5	400	2.00
13	6	NE	End	SW	30	5	400	2.00	33	6	North	Semi	South	30	5	400	2.00
14	6	NE	Mid	SW	30	5	400	2.00	34	11	NW	Semi	SE	30	7	400	2.80
15	6	NE	End	SW	45	5	400	2.00	35	9	NW	Semi	SE	30	6	400	2.40
16	APT	NW	Flat	SE	30	4	400	1.60	36	24	NW	Semi	SE	30	7	400	2.80
17	APT	NW	Flat	SE	30	4	400	1.60	37	24	NW	Semi	SE	30	7	400	2.80
18	APT	NW	Flat	SE	30	4	400	1.60	38	12	NW	Semi	SE	30	6	400	2.40
19	APT	NW	Flat	SE	30	4	400	1.60	39	12	NW	Semi	SE	30	6	400	2.40
20	APT	NW	Flat	SE	30	4	400	1.60	40	10	NW	Det	SE	45	6	400	2.40

Energy, Primary Energy, Carbon and running costs based current proposals

Development (Proposed)	m ²
GIFA (Development)	3712.60
Energy	KwH
Heating	109,154.06
Hot water	103,802.49
Fans and Pumps	5,190.04
Lighting	9,384.95
Appliances	111,611.44
Cooking	22,746.45
Total Energy use	361,889.44
Energy Kw per m ² of floor area	97.48
Energy (Primary)	Kwpe
Heating	123,344.08
Hot water	117,296.82
Fans and Pumps	7,790.25
Lighting	14,086.82
Appliances	167,528.78
Cooking	34,142.42
Total Energy use	464,189.17
Energy Kw per m ² of floor area	125.03
CO2 emissions	Kg CO2
Heating	22,922.35
Hot water	21,798.52
Fans and Pumps	705.85
Lighting	1,276.35
Appliances	15,179.16
Cooking	3,093.52
Total CO2 emissions	64,975.75
Annual predicted carbon emissions per m ² of floor area	17.50
Running Cost	£ pa
Heating	£ 6,723.89
Hot water	£ 6,394.23
Fans and Pumps	£ 1,374.32
Lighting	£ 2,485.14
Appliances	£ 29,554.71
Cooking	£ 6,023.26
Standing Charges	£ 11,635.20
Total Running Costs	£ 64,190.75
Average annual Running Costs per residential unit	£ 1,604.77

Estimated fuel costs are based on the Government price cap figures from July 2025, running costs are for comparison purposes and actual running costs may differ depending on actual use.

2.3. Reduction in Carbon, Energy from improved fabric and mechanical specification

Energy (KwH)	NOTIONAL	PROPOSED
Heating	110,494.62	109,154.06
Hot water	115,901.57	103,802.49
Fans and Pumps	3,440.00	5,190.04
Lighting	8,354.58	9,384.95
Appliances	111,611.44	111,611.44
Cooking	22,746.45	22,746.45
Photovoltaic (electricity used in dwelling)	-33,549.81	-30,322.04
Photovoltaic (electricity exported)	-50,079.46	-38,372.87
Total	288,919.40	293,194.52
Reduction in energy		-4275.12
Percentage reduction		-1.48%

Energy Primary (Kwpe)	NOTIONAL	PROPOSED
Heating	124,858.93	123,344.08
Hot water	130,968.78	117,296.82
Fans and Pumps	5,163.44	7,790.25
Lighting	12,540.23	14,086.82
Appliances	167,528.78	167,528.78
Cooking	34,142.42	34,142.42
Photovoltaic (electricity used in dwelling)	-50,358.27	-45,513.39
Photovoltaic (electricity exported)	-22,535.76	-17,267.79
Total	402,308.55	401,407.99
Reduction in energy		900.56
Percentage reduction		0.22%

Carbon emissions (Kg/CO2)	NOTIONAL	PROPOSED
Heating	23,203.87	22,922.35
Hot water	24,339.33	21,798.52
Fans and Pumps	467.84	705.85
Lighting	1,136.22	1,276.35
Appliances	15,179.16	15,179.16
Cooking	3,093.52	3,093.52
Photovoltaic (electricity used in dwelling)	-4,562.77	-4,123.80
Photovoltaic (electricity exported)	-6,810.81	-5,218.71
Total	56,046.36	55,633.24
Reduction in Carbon emissions		413.12
Percentage reduction		0.74%

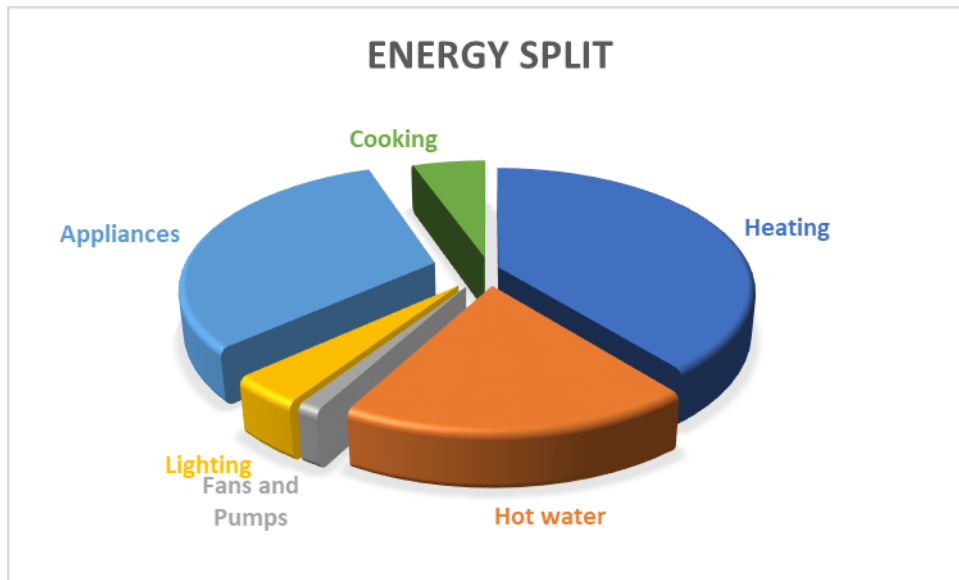
Reduction from Low or Zero Carbon Technologies

Energy	Kwh
Heating	109,154.06
Hot water	103,802.49
Fans and Pumps	5,190.04
Lighting	9,384.95
Appliances	111,611.44
Cooking	22,746.45
Sub TOTAL	361,889.44
Reduction in energy through LZC technology	-68,694.91
Total	293,194.52
Percentage reduction	18.98%

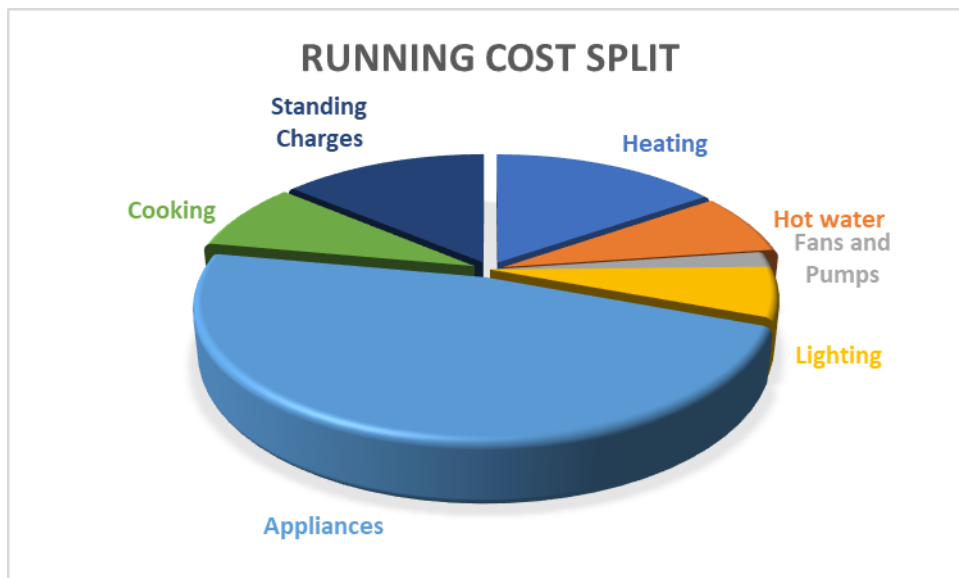
Energy (Primary)	Kwpe
Heating	123,344.08
Hot water	117,296.82
Fans and Pumps	7,790.25
Lighting	14,086.82
Appliances	167,528.78
Cooking	34,142.42
Sub TOTAL	464,189.17
Reduction in PRIMARY energy through LZC technology	-62,781.18
Total	401,407.99
Percentage reduction	13.52%

Carbon emissions	Kg/CO2
Heating	22,922.35
Hot water	21,798.52
Fans and Pumps	705.85
Lighting	1,276.35
Appliances	15,179.16
Cooking	3,093.52
Sub TOTAL	64,975.75
Reduction in Carbon emissions through LZC technology	-9,342.51
Total	55,633.24
Percentage reduction	14.38%

Total energy consumption split by use

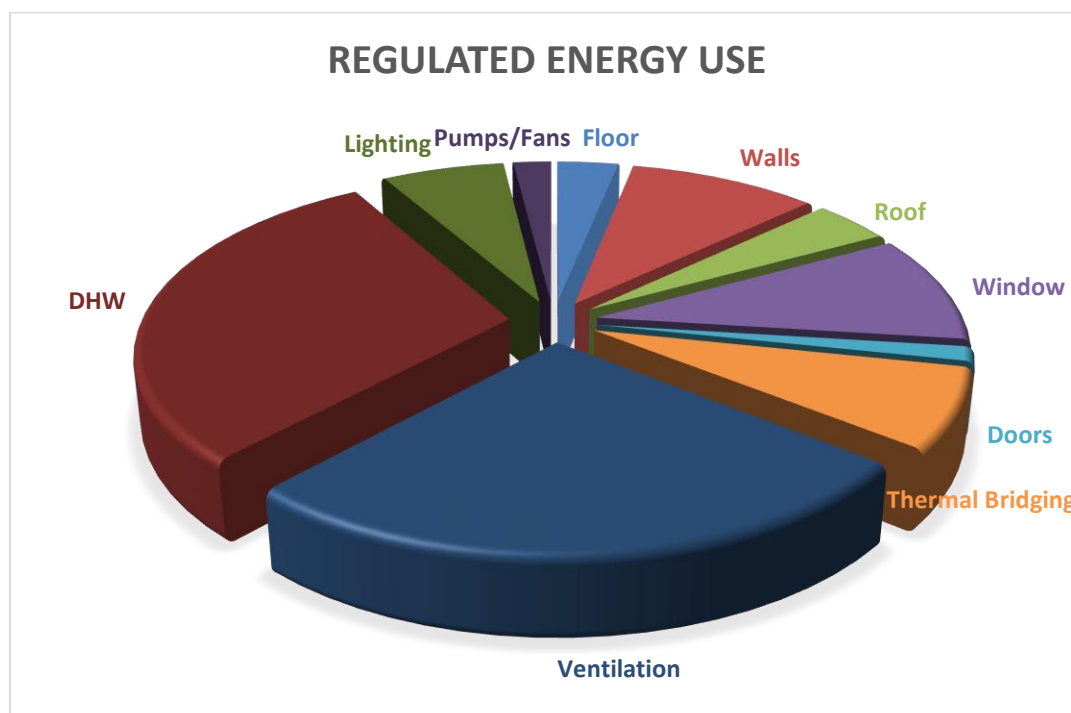


Total running cost split by use (Post April 2022 price cap)



2.4. Fabric (Be Lean)

Split of fabric losses in an average semidetached House with GIFA of 121m² dwelling built to AD. L1 2021 fabric specification (Notional dwelling, please refer to Table 1.1 on Page 17 of this report)



The affects from fabric improvements represent an approximately 25% of the total energy requirements from a typical new build home built to 2013/2021 building regulations standard and approximately 50% of regulated emissions (excluding use .i.e. cooking and appliances) as assessed using steady state assessment methodologies such as SAP etc. Improvements to individual fabric elements can have very limited effect on Energy/Carbon reduction although this is not a reason not to reduce heat loss and reduce heating loads by improving fabric and reducing losses associated with thermal bridging and ventilation losses.

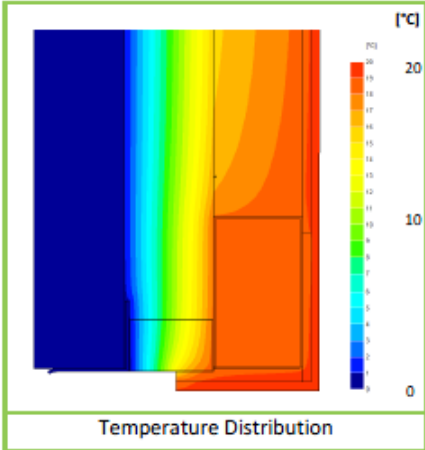
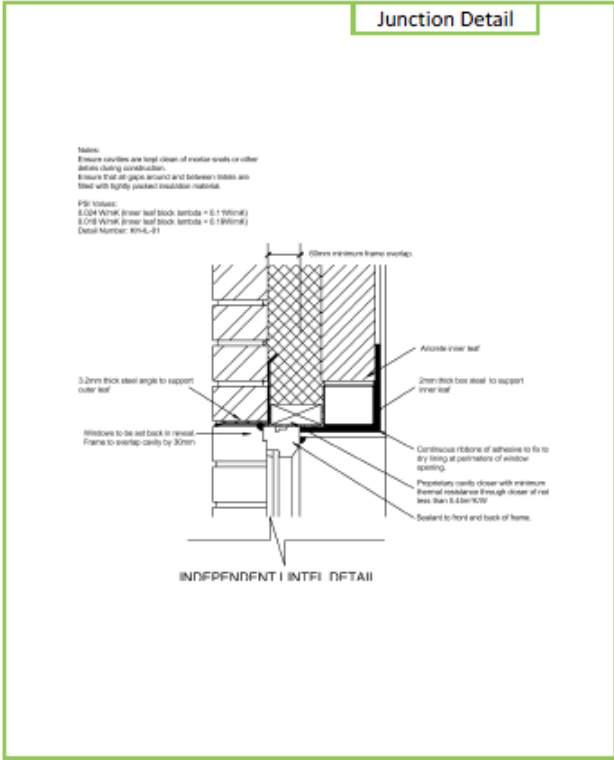
Future retro improvements made to a building's fabric are expensive, disruptive and most of the time impractical and therefore the thermal qualities of the building fabric must be one of the main considerations for long term energy and CO₂ reduction.

Reducing Energy and Carbon emissions from a development by increasing the fabric specification provides the development with a high degree of longevity, by limiting the heat losses across the building envelope over the dwelling's lifetime.

Improving the fabric specification at design stage will ensure that these dwellings do not become the "hard to treat dwellings" of the future.

It can be seen that thermal bridging will contribute to over 15% of a dwellings heating requirements, loses associated from junctions have been considered in detail and have been improved through modelling by the use of specialist 2D/3D thermal modelling software to BR433. Areas of high thermal loss will be identified and improved as required.

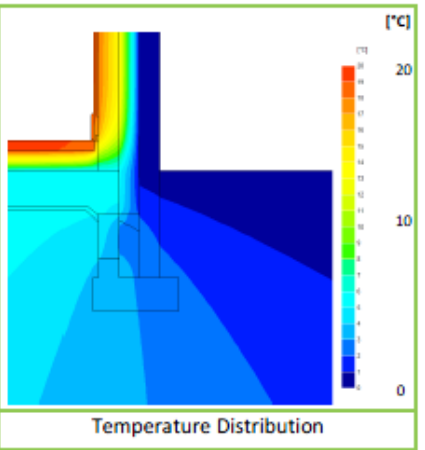
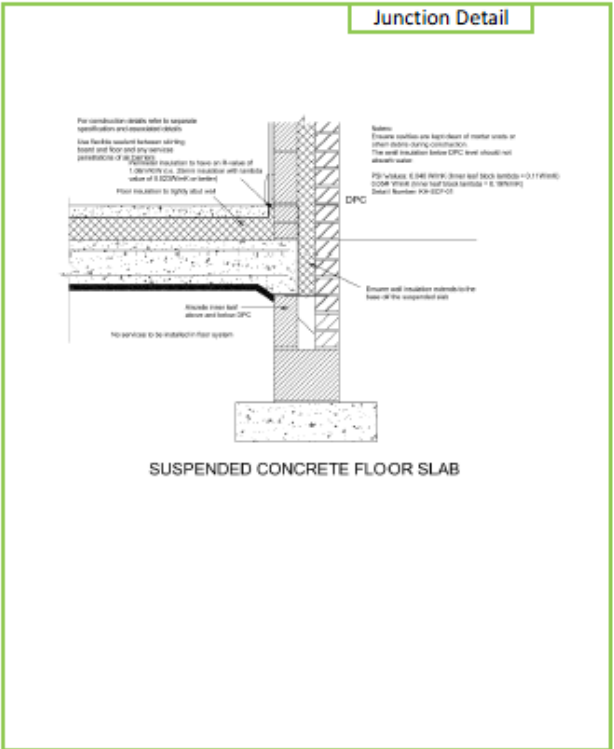
Example of a window lintel detail



Linear Thermal Transmittance W/m.K	
$\psi =$	0.018

Temperature Factor ³ for Humidity and Mould	
$f =$	0.939

Example of an exposed ground floor / wall bridging detail.



Linear Thermal Transmittance W/m.K	
$\psi =$	0.040

Temperature Factor ³ for Humidity and Mould	
$f =$	0.924

3. Introduction

Anderson Goddard Ltd has been commissioned by Henry Boot to provide an Energy Statement and Low or Zero Carbon (LZC) feasibility assessment for the proposed development at Highmoor Lane, CLECKHEATON, BD19 6LW. This report will consider the requirements of compliance with the building regulations in terms of Carbon and Primary Energy metrics and will also consider the use of high efficiency alternative systems in line with the requirements of Regulation 25a, Approved Document Part L1 of the building regulations (England) 2021.

The following will be considered.

- Energy generated from the LZC technology
- Payback
- Land use
- Local planning requirements
- Noise
- Whole life costs and lifecycle impact of the potential specification in terms of carbon emissions
- Any available grants
- All technologies appropriate to the site and energy demand of the development
- Reasons for excluding other technologies

3.1 Assessment methodology

The following methodologies approved documentation and practices have been used in the compilation of this report.

- SAP 10.2
- Approved document Part L1 of the building regulations 2021

SAP, the governments “Standard Assessment Procedure” for calculating the energy performance of a dwelling and is used primarily for the purpose of satisfying approved document Part L1 of the Building regulations 2021

Appliances

The second part of the calculation takes into account electrical use from appliances ref appendix L2 SAP 2012

$$E_a = 207.8 \times (TFA \times N)^{0.4714}$$

$$E_a \times E_{\text{Electricity}} / TFA$$

Where TFA is the total floor area in m² and N is the assumed number of occupants

Cooking

$$(119 + 24N) / TFA$$

Where TFA is the total floor area and N is the number of occupants

All assessments of benefit in terms of CO₂ reduction provided by upgrade measures or LZC technologies including heating and innovative technologies will be assessed as a percentage of the total estimated CO₂ emissions which will include heating, ventilation, lighting, pumps and fans from SAP 2005 and also CO₂ emissions provided by the calculation process above for Cooking and appliances.

Regulated Use

- Heating
- Ventilation
- Lighting
- Pumps and fans

Un-Regulated use

- Cooking
- Appliances

A SAP calculation generates four ratings a SAP rating and potential SAP rating and Environmental Impact (EI) rating and potential EI rating, all ratings are out of 100.

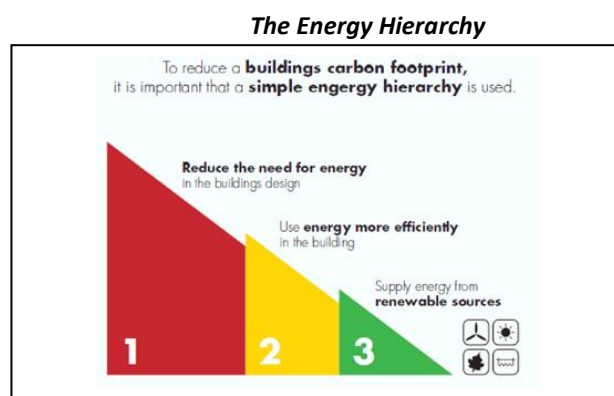
A SAP rating is an indication of heating and lighting costs, the higher the rating the lower the fuel costs will be.

Environmental Impact (EI) rating is an indication of CO₂ emissions produced by heating and lighting, the higher the rating the lower the Carbon emissions will be.

3.2 Energy Hierarchy

In line with best practice, the proposed buildings energy strategy should adhere to the principles of the Energy Hierarchy.

- **Be Lean** – reduce the need for energy.
- **Be Clean** – supply and use energy in the most efficient manner.
- **Be Green** – supply energy from renewable sources.



Adhering to the principles of the Energy Hierarchy has a number of benefits.

- By reducing the energy requirement of the building, the burden of renewable requirement shrinks in proportion. This has obvious financial benefits and will help meet part L of building regulations and any further reductions in carbon emissions required.
- The sustainable credentials of the development are enhanced and are not validated by simply bolting on expensive renewable equipment. By focusing on fabric performance and the provision of efficient heating/cooling systems the building is intrinsically “green”.

The lean measures are those measures which cumulatively reduce the energy requirement of the development through the construction of a thermally efficient building envelope. The measures included in this section of the report constitute the lean efforts.

“Fabric First”

Improved fabric specification

Fabric Enhancements are shown on Page 9 – Be-Lean

High efficient technologies

High efficiency heating technology such as heat pumps will have the greatest effect on reducing carbon emissions.

Energy efficiency within the building – Be Clean

Renewables

Microgeneration technologies including Photovoltaic technology will have the largest benefit in reducing occupiers running costs and reducing Primary Energy.

Installation of Renewable Energy – Be Green

LZC technology

An assessment of renewable technologies has taken place to determine technical and financial viability.

The following technologies would not be technically viable and/or would not provide the required reduction in either CO₂ emissions or energy.

- Solar thermal
- Micro wind
- District heating, CHP

Heat pump technology

Pros

- Would provide the largest reduction in carbon emissions when compared to other LZC technologies
- Maintenance requirements would be lower than more conventional systems

Cons

- Would require additional land use
- May be noisy in operation
- Would be more expensive to operate compared to more conventional systems

Photovoltaic

Pros

- Would provide the most cost-effective solution from a lifetime cost perspective as compared to other technologies
- Dwellings installed with Photovoltaic panels will have an Energy Performance Rating of 'A'
- Would provide the largest reduction in fuel costs as experienced by the occupant
- Would provide high reduction in energy
- Would not require any user operation
- Would require minimal change of habit by the occupant
- Would be silent in operation
- Would require very little maintenance when compared against other LZC technologies

Cons

- Would require suitable roof orientation and configurations, site layout etc
- Would have minimal effect on reducing carbon emissions when compared to Heat Pump technology

3.3 Building regulation requirements

Approved Document Part L1 of the Building Regulations 2021 (England)

Regulation 25

Regulation 25 requires the Secretary of State to approve minimum energy performance requirements. These requirements are in the form of a target primary energy rate, a target emission rate and a target fabric energy efficiency rate.

The targets are set out in Section 1 of this approved document.

Regulations 26, 26A and 26C

A newly constructed dwelling must be shown to meet regulations 26, 26A and 26C by producing calculations to show that the dwelling meets all of the following.

- a. Target primary energy rate.
- b. Target emission rate.
- c. Target fabric energy efficiency rate.

Section 2 of this approved document sets out how to produce these calculations.

Regulations 27, 27A and 27C

Both before and after a newly constructed dwelling is built, a notice must be given to the building control body of the calculations.

Regulation 25A: Consideration of high-efficiency alternative systems

This section deals with the requirements of regulation 25A of the Building Regulations 2010.

Regulation
Consideration of high-efficiency alternative systems for new buildings
25A. (1) Before construction of a new building starts, the person who is to carry out the work must analyse and take into account the technical, environmental and economic feasibility of using high-efficiency alternative systems (such as the following systems) in the construction, if available— (a) decentralised energy supply systems based on energy from renewable sources; (b) cogeneration; (c) district or block heating or cooling, particularly where it is based entirely or partially on energy from renewable sources; and (d) heat pumps.
(2) The person carrying out the work must— (a) not later than the beginning of the day before the day on which the work starts, give the local authority a notice which states that the analysis referred to in paragraph (1)— (i) has been undertaken; (ii) is documented; and (iii) the documentation is available to the authority for verification purposes; and (b) ensure that a copy of the analysis is available for inspection at all reasonable times upon request by an officer of the local authority.
(3) An authorised officer of the local authority may require production of the documentation in order to verify that this regulation has been complied with.
(4) The analysis referred to in paragraph (1)— (a) may be carried out for individual buildings or for groups of similar buildings or for common typologies of buildings in the same area; and (b) in so far as it relates to collective heating and cooling systems, may be carried out for all buildings connected to the system in the same area.

Regulation continued

- (5) In this regulation—
- (a) "cogeneration" means simultaneous generation in one process of thermal energy and one or both of the following—
- (i) electrical energy;
 - (ii) mechanical energy;
- (b) "district or block heating or cooling" means the distribution of thermal energy in the form of steam, hot water or chilled liquids, from a central source of production through a network of multiple buildings or sites, for the use of space or process heating or cooling;
- (c) "energy from renewable sources" means energy from renewable non-fossil sources, namely wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases; and
- (d) "heat pump" means a machine, a device or installation that transfers heat from natural surroundings such as air, water or ground to buildings or industrial applications by reversing the natural flow of heat such that it flows from a lower to a higher temperature. (For reversible heat pumps, it may also move heat from the building to the natural surroundings.)

Table 1.1 Summary of notional dwelling specification for new dwelling⁽¹⁾

Element or system	Reference value for target setting
Opening areas (windows, roof windows, rooflights and doors)	Same as for actual dwelling not exceeding a total area of openings of 25% of total floor area ⁽²⁾
External walls including semi-exposed walls	$U = 0.18 \text{ W/(m}^2\text{K)}$
Party walls	$U = 0$
Floors	$U = 0.13 \text{ W/(m}^2\text{K)}$
Roofs	$U = 0.11 \text{ W/(m}^2\text{K)}$
Opaque door (less than 30% glazed area)	$U = 1.0 \text{ W/(m}^2\text{K)}$
Semi-glazed door (30–60% glazed area)	$U = 1.0 \text{ W/(m}^2\text{K)}$
Windows and glazed doors with greater than 60% glazed area	$U = 1.2 \text{ W/(m}^2\text{K)}$ Frame factor = 0.7
Roof windows	$U = 1.2 \text{ W/(m}^2\text{K)}$, when in vertical position (for correction due to angle, see specification in SAP 10 Appendix R)
Rooflights	$U = 1.7 \text{ W/(m}^2\text{K)}$, when in horizontal position (for correction due to angle, see specification in SAP 10 Appendix R)
Ventilation system	Natural ventilation with intermittent extract fans
Air permeability	$5 \text{ m}^3/(\text{h}\cdot\text{m}^2)$ at 50 Pa
Main heating fuel (space and water)	Mains gas
Heating system	Boiler and radiators Central heating pump 2013 or later, in heated space Design flow temperature = 55 °C
Boiler	Efficiency, SEDBUK 2009 = 89.5%
Heating system controls	Boiler interlock, ErP Class V Either: – single storey dwelling in which the living area is greater than 70% of the total floor area: programmer and room thermostat – any other dwelling: time and temperature zone control, thermostatic radiator valves
Hot water system	Heated by boiler (regular or combi as above) Separate time control for space and water heating
Wastewater heat recovery (WWHR)	All showers connected to WWHR, including showers over baths Instantaneous WWHR with 36% recovery efficiency utilisation of 0.98
Hot water cylinder	If cylinder, declared loss factor = $0.85 \times (0.2 + 0.051 V^{2/3}) \text{ kWh/day}$ where V is the volume of the cylinder in litres
Lighting	Fixed lighting capacity (lm) = 185 × total floor area Efficacy of all fixed lighting = 80 lm/W
Air conditioning	None
Photovoltaic (PV) system	For houses: kWp = 40% of ground floor area, including unheated spaces / 6.5 For flats: kWp = 40% of dwelling floor area / (6.5 × number of storeys in block) System facing south-east or south-west

NOTE:

1. For a dwelling connected to an existing district heat network, an alternative notional building is used. See paragraph 1.8 and SAP 10.
2. See SAP 10 for details.

3.4 Sustainability

Water Consumption

Wholesome water consumption will be limited to less than 110Litres per person per day

Installation Type	Unit	Capacity / Flow Rate	Use Factor	Fixed Uses	Litres/ Person / Day
WCs (Multiple fittings)	Full flush volume (litres)	3.06	4.42	0	13.53
Taps (Excluding Kitchen and utility)	Flow Rate (litres / minute)	6.00	1.58	1.58	11.06
Bath (Where shower is also present)	Capacity to overflow (litres)	170.00	0.11	0	18.70
Shower (Where bath is also present)	Flow Rate (litres / minute)	8.00	4.37	0	34.96
Bath only	Capacity to overflow (litres)		0.50	0	0.00
Shower only	Flow Rate (litres / minute)		5.60	0	0.00
Kitchen/Utility Tap	Flow Rate (litres / minute)	8.00	0.44	10.36	13.88
Washing Machine	Litres / kg dry load	8.17	2.1	0	17.16
Dishwasher	Litres / place setting	1.25	3.6	0	4.50
Waste Disposal	Litres / use		3.08	0	0.00
Water Softener	Litres / person / day		1	0	0.00
Total (Litres/Person/Day)					113.79
Contribution from grey water (litres/Person/Day)					0.00
Contribution from rainwater (litres/Person/Day)					0.00
Normalisation Factor					0.91
Total (Litres / person / day)					103.55
External water use (litres/Person/Day)					5.00
Total (Litres/person/day) (Total + External use)					108.55

Waste Management

Responsibilities

- All employees should take responsibility in proper disposal of waste
- External contractors must take responsibility in disposing of their wastes effectively either by following waste procedure or taking the waste with them off site.
- Those in management position (including Team Leaders) should take extra care to ensure that their employees are disposing of waste correctly, this includes providing any training where necessary.
- All employees should collaborate to find the most sustainable methods of managing waste as far as reasonably practicable.

Definitions

- Waste: A material or substance that is eliminated or discarded as no longer useful or required after the completion of a process.
- General waste: Any waste that is not currently segregated within waste streams.
- Hazardous waste: Any waste that is considered harmful to humans and/or the environment.
- Recyclable waste: Any waste materials that are able to be converted into usable objects to prevent wastage of material resources and consumption of fresh raw materials.
- Environmental Impact: Activities, products or services that interacts or can interact with the environment

Environmental policy

In order to minimise environmental impacts concerning our activities products and services

The organization shall:

- Comply with applicable legal obligations and other related requirements to which the company subscribes which relate to its environmental aspects.
- To include the consideration of its environmental issues in all business strategies and initiatives
- Be committed to ensure that the protection of the environment is firmly embedded in both the company's and all employees culture and will endeavor to influence its suppliers and customers in a similar strategic environmental manner.
- Prevent pollution, reduce waste and minimise the consumption of resources.
- Consider the wider global impact of all our activities including those of our suppliers' customers and stakeholders
- Continually drive improvement of the environmental management system.
- Educate, train and motivate employees to carry out tasks in an environmentally responsible manner and maintain a continuous professional development strategy
- Encourage environmental protection amongst suppliers and subcontractors
- To investigate the feasibility of influencing its suppliers' customers and third parties with consideration to life cycle impacts of the aspects and activities.
- Encourage and enhance biodiversity and ecology
- Ensure the policy is communicated to employees and relevant third parties. The organisation requires and expects all persons who are employed by the organisation including contractors and visitors to co-operate with and conform to this Policy.
- Ensure that all staff, contractors and others have access to this policy.

4 Low or Zero Carbon overview

The following Low or Zero Carbon technologies are commercially available for use in the UK housing sector; the following overview will give a brief description of each technology which will provide a better understanding of how each technology works and its appropriation for use, either for use in this project or for future projects.

Low or zero carbon technologies available in the UK

Zero carbon technologies

- Solar Hot Water
- Solar Photovoltaic
- PV-Thermal
- Small scale hydro power
- Wind turbines
- Solar Air heating

Low carbon technologies

- Biomass
- Combined Heat and Power (CHP) and micro CHP
- Community heating, including utilising waste heat from processes such as large scale power generation where the majority of heating comes from waste heat
- Heat pumps, Ground source heat pumps (GSHP) Geothermic heating systems, Air source.
- Other technologies, Fuel cells using hydrogen from any of the above renewable sources

Other innovative technologies

- Flue Gas Heat recovery systems (FGHRS)
- Shower saver Waste Water Heat Recovery (WWHRS)
- Sunwarm
- Geothermic storage

4.1 Solar Water



Solar water heating systems use heat from the sun to work alongside conventional primary water heaters. The technology is well developed with a large choice of equipment to suit many applications.

For domestic hot water there are three main components

Solar panels or collectors - are fitted to your roof. They collect heat from the sun's radiation. There are 2 main types of collector:

Flat plate systems - which are comprised of an absorber plate with a transparent cover to collect the sun's heat, or

Evacuated tube systems - which are comprised of a row of glass tubes that each contains an absorber plate feeding into a manifold which transports the heated fluid.

A heat transfer system - uses the collected heat to heat water;

Hot water cylinder - stores the hot water that is heated during the day and supplies it for use later.

Fuel Displaced	£ Saving per year	CO2 saving per year
Gas	£50	325 kg
Electricity	£80	635 kg
Oil	£65	365 kg
Solid	£55	645 kg

All savings are approximate and are based on the hot water heating requirements of a 3 bed semidetached home.

Solar water heating can be used in the home or for larger applications, such as swimming pools. For a domestic system you will need 3-4 square metres of southeast to southwest facing roof receiving direct sunlight for the main part of the day, a space to locate an additional water cylinder if required.

In England, changes to permitted development rights for micro generation technologies introduced on 6th April 2008 have lifted the requirements for planning permission for most solar water heating installations. Roof mounted and stand-alone systems can now be installed in most dwellings, as long as they respect certain size criteria. Exceptions apply for Listed Buildings, and buildings in Conservation Areas and World Heritage Sites.

In Wales, Scotland and Northern Ireland, the devolved governments are currently all considering changes to their legislation on permitted developments, to facilitate installations of micro generation technologies, including solar water heating. Legislation is expected in all three countries later this year. Until then, householders in Wales, Scotland and Northern Ireland must consult with their local authority regarding planning permission.

Solar water heating systems tend to require little maintenance Installation and maintenance costs.

The typical installation cost for a domestic system is £3,000 - £5,000. Evacuated tube systems are more advanced in design than flat plate, and so tend to be more expensive.

Solar water heating systems generally come with a 5-10 year warranty and require regular maintenance. A yearly check by the householder and a more detailed check by a professional installer every 3-5 years should be sufficient.

4.2 Solar Photovoltaic



Solar PV (photovoltaic) uses energy from the sun to create electricity to run appliances and lighting. PV requires only daylight - not direct sunlight - to generate electricity.

How it works

Photovoltaic systems use cells to convert solar radiation into electricity. The PV cell consists of one or two layers of a semi conducting material, usually silicon. When light shines on the cell it creates an electric field across the layers, causing electricity to flow. The greater the intensity of the light, the greater the flow of electricity...PV systems generate no greenhouse gases, saving approximately 325kg of carbon dioxide emissions per year - adding up to about 8 tonnes over a system's lifetime - for each kilowatt peak (kWp - PV cells are referred to in terms of the amount of energy they generate in full sun light).

PV arrays now come in a variety of shapes and colours, ranging from grey 'solar tiles' that look like roof tiles, to panels and transparent cells that you can use on conservatories and glass to provide shading as well as generating electricity. As well as enabling you to generate free electricity they can provide an interesting alternative to conventional roof tiles!

PV systems for a building with a roof or wall that faces within 90 degrees of south, as long as no other buildings or large trees overshadow it.

If the roof surface is in shadow for parts of the day, the output of the system decreases. Solar panels are not light and the roof must be strong enough to take their weight, especially if the panel is placed on top of existing tiles. Solar PV installations should always be carried out by a trained and experienced installer. The area of PV required to generate 1 kw hour peak varies but generally 6-8m² for Môn crystalline or 10² for polycrystalline modules of PV will produce 1 Kw peak of electricity.

Cost and maintenance

Prices for PV systems vary, depending on the size of the system to be installed, type of PV cell used and the nature of the actual building on which the PV is mounted. The size of the system is dictated by the amount of electricity required. For the average domestic system, costs can be around £4,000- £9,000 per kWp installed, with most domestic systems usually between 1.5 and 2 kWp. Solar tiles cost more than conventional panels, and panels that are integrated into a roof are more expensive than those that sit on top. Grid connected systems require very little maintenance, generally limited to ensuring that the panels are kept relatively clean and that shade from trees has not become a problem.

The wiring and components of the system should however be checked regularly by a qualified technician. Stand-alone systems, i.e. those not connected to the grid, need maintenance on other system components, such as batteries.

4.3 Solar PV / Thermal



PV-T is an integrated panel that produces both electricity and heat.

Benefit

Traditional PV systems produce heat as a by product of the electric production which causes the PV collector to reduce in efficiency, as a rule of thumb a PV collector will reduce in efficiency by 0.5% for every 1°C increase in temperature above normal operating temperatures, PV temperatures can exceed 85°C. PV-T systems are designed to cool the collectors and use the collected heat for water and space heating.

How it works

By cooling the PV panel with either water or air the collector will operate up to 25% more efficiently resulting in a smaller area of PV required to generate the same amount of energy compared to a typical PV collector, the heated water or air can then be used to provide the dwelling with heating and or hot water depending on system design.

Cost and Maintenance

The cost of the PV-T system will be very similar to the combined cost of Solar thermal and solar PV and the technology is more suited to Code 5 or code 6 plots because of the reduced area of PV required which would free up available roof area.

4.4 Hydro



Hydro power systems use running water turning a turbine to produce electricity. A micro hydro plant is one that generates less than 100kW. Improvements in small turbine and generator technology mean that micro hydro schemes are an attractive means of producing electricity. Useful power may be produced from even a small stream.

Benefits

For houses with no mains connection but with access to a micro hydro site, a good hydro system can generate a steady, more reliable electricity supply than other renewable technologies at a lower cost. Total system costs can be high but often less than the cost of a grid connection and with no electricity bills to follow. It should be noted that in off grid applications the power is used for lighting and electrical appliances. However, space and water heating can be supplied when available power exceeds demand. Hydro power systems convert potential energy stored in water held at height to kinetic energy

How it works

Hydro power systems convert potential energy stored in water held at height to kinetic energy (or the energy used in movement) to turn a turbine to produce electricity.

Energy available in a body of water depends on the water's flow rate and the height (or head) that the water falls. These are divided into low head, medium head and high head, where the height drop is greater. The scheme's actual output will depend on how efficiently it converts the power of the water into electrical power (maximum efficiencies of over 90% are possible but for small systems 60 - 80% is more realistic).

Hydro power requires the source to be relatively close to where the power will be used or to a suitable grid connection. Hydro systems can be connected to the main electricity grid or as a part of a standalone (off grid) power system. In a grid connected system, any electricity generated but not used can be sold to electricity companies.

In an off grid hydro system, electricity can be supplied directly to the devices powered or through a battery bank and inverter set up. A back up power system may be needed to compensate for seasonal variations in water flow.

Costs and savings

Hydro costs are very site specific and are related to energy output. For low head systems (assuming there is an existing pond or weir), costs may be in the region of £4,000 per kW installed up to about 10kW and would drop per kW for larger schemes.

For medium heads, there is a fixed cost of about £10,000 and then about £2,500 per kW up to around 10kW - so a typical 5kW domestic scheme might cost £20-£25,000. Unit costs drop for larger schemes. Maintenance costs vary but small scale hydro systems are very reliable.

4.5 Micro wind



Wind turbines use the wind's lift forces to rotate aerodynamic blades that turn a rotor which creates electricity. In the UK we have 40% of Europe's total wind energy. But it's still largely untapped and only 0.5% of our electricity requirements are currently generated by wind power.

How does it work? Most small wind turbines generate direct current (DC) electricity. Systems that are not connected to the national grid require battery storage and an inverter to convert DC electricity to AC (alternating current - mains electricity).

Wind systems can also be connected to the national electricity grid. A special inverter and controller convert DC electricity to AC at a quality and standard acceptable to the grid. No battery storage is required. Any unused or excess electricity may be able to be exported to the grid and sold to the local electricity supply company.

There are two types of wind turbines:

Mast mounted - which are free standing and located near the building(s) that will be using the electricity.

Roof mounted - which can be installed on house roofs and other buildings.

Benefits

Wind power is a clean, renewable source of energy which produces no carbon dioxide emissions or waste products.

In the UK we have 40% of Europe's total wind energy

Individual turbines vary in size and power output from a few hundred watts to two or three megawatts (as a guide, a typical domestic system would be 1 - 6 kilowatts). Uses range from very small turbines supplying energy for battery charging systems (e.g. on boats or in homes), to turbines on wind farms supplying electricity to the grid.

You should consider the following issues if you're thinking about small scale wind. An accredited installer will be able to provide more detailed advice. Wind speed increases with height so it's best to have the turbine high on a mast or tower.

Generally speaking the ideal site is a smooth top hill with a flat, clear exposure, free from excessive turbulence and obstructions such as large trees, houses or other buildings.

Small scale wind power is particularly suitable for remote off grid locations where conventional methods of supply are expensive or impractical. Please note that the electricity generated at any one time by a wind turbine is highly dependent on the speed and direction of the wind. The wind speed itself is dependent on a number of factors, such as location within the UK, height of the turbine above ground level and nearby obstructions. Ideally, you should undertake a professional assessment of the local wind speed for a full year at the exact location where you plan to install a turbine before proceeding. In practice, this may be difficult, expensive and time consuming to undertake. Therefore I recommend that, if you are considering a domestic building mounted installation and electricity generation is your main motivation, then you only consider a wind turbine under the following circumstances:

The local annual average wind speed is 6 m/s or more. There are no significant nearby obstacles such as buildings, trees or hills that are likely to reduce the wind speed or increase turbulence

Planning issues such as visual impact, noise and conservation issues also have to be considered. System installation normally requires permission from the local authority.

Roof mounted

These cost from £3000. The amount of energy and carbon that roof top micro wind turbines save depends on several things including size, location, wind speed, nearby buildings and the local landscape. At the moment there is not enough data from existing wind turbine installations to provide a figure of how much energy and carbon could typically be saved. The Energy Saving Trust is monitoring up to 100 wind turbine installations; the results of this activity will help to provide further information for householders considering this technology.

Mast mounted

Larger systems in the region of 2.5kW to 6kW would cost between £11,000 - £19,000 installed. These costs are inclusive of the turbine, mast, inverters, battery storage (if required) and installation; however it's important to remember that costs always vary depending on location and the size and type of system. Turbines can have a life of up to 22.5 years but require service checks every few years to ensure they work efficiently. For battery storage systems, typical battery life is around 6-10 years, depending on the type, so batteries may have to be replaced at some point in the system's life.

4.6 Bio Mass



Biomass is produced from organic materials, either directly from plants or indirectly from industrial, commercial, domestic or agricultural products. It is often called 'bio energy' or 'bio fuels'. It doesn't include fossil fuels, which have taken millions of years to be created.

Biomass fall into two main categories:

Woody biomass includes forest products, untreated wood products, energy crops and short rotation coppice (SRC), which are quick-growing trees like willow.

Non-woody biomass includes animal waste, industrial and biodegradable municipal products from food processing and high energy crops. Examples are rape, sugar cane, maize.

For small-scale domestic applications of biomass the fuel usually takes the form of wood pellets, wood chips or wood logs



The benefits

Producing energy from biomass has both environmental and economic advantages.

Although biomass produces CO₂ it only releases the same amount that it absorbed whilst growing, which is why it is considered to be carbon neutral. Furthermore, biomass can contribute to waste management by harnessing energy from products that are often disposed of at landfill sites.

It is most cost effective and sustainable when a local fuel source is used, which results in local investment and employment and also minimises transport miles to your home.

Fuel

It's important to have storage space for the fuel, appropriate access to the boiler for loading and a local fuel supplier.

Flue

The vent material must be specifically designed for wood fuel appliances and there must be sufficient air movement for proper operation of the stove. Chimneys can be fitted with a lined flue.

Regulations

The installation must comply with all safety and building regulations.

See Part L of the Building Regulations, Northern Ireland

See Section 3 of the Technical Handbooks, Scotland

Smokeless zones

Wood can only be burnt in exempted appliances, under the Clean Air Act.

Planning

If the building is listed or in an area of outstanding natural beauty (AONB), then you will need to check with your Local Authority Planning Department before a flue is fitted.

Costs and savings

Standalone room heaters generally cost £2,000 to £4,000 installed. Savings will depend on how much they are used and which fuel you are replacing. A biomass stove which provides a detached home with 10% of annual space heating requirements could save around 840kg of carbon dioxide when installed in an electrically heated home. Due to the higher cost of biomass pellets compared with other traditional heating fuels, and the relatively low efficiency of the stove compared to a central heating system it will cost more to run.

The cost for boilers varies depending on the system choice; a typical 15kW (average size required for a three-bedroom semidetached house) pellet boiler would cost around £5,000 - £14,000 installed, including the cost of the flue and commissioning. A manual log feed system of the same size would be slightly cheaper. A wood pellet boiler could save you around £750 a year in energy bills and around 6 tonnes of CO₂ per year when installed in an electrically heated home.

Unlike other forms of renewable energy, biomass systems require you to pay for the fuel. Fuel costs generally depend on the distance from your supplier and whether you can buy in large quantities.

4.7 Heat Pumps

There are two types of heat pumps, ground source and air source.

Heat pumps work in a very similar way to fridges and air conditioners and absorb heat from the ground or from the air.

Ground or air source heat pumps are mainly designed to work with under floor heating systems because of the lower design temperatures of under floor systems.

Efficiencies of ground source heat pumps are between 350%-400% and air source between 200%-250%.

Heat pumps are a viable alternative to electric, LPG and oil fuel boilers, but are not considered as an alternative to natural gas.

Ground source heat pumps

Ground source heat pumps use a buried ground loop which transfers heat from the ground into a building to provide space heating and, in some cases, to pre-heat domestic hot water. As well as ground source heat pumps, air source and water source heat pumps are also available.

The benefits

The efficiency of a ground source heat pump system is measured by the coefficient of performance (CoP). This is the ratio of units of heat output for each unit of electricity used to drive the compressor and pump for the ground loop. Average CoP over the year, known as seasonal efficiency, is around 3-4 although some systems may produce a greater rate of efficiency. This means that for every unit of electricity used to pump the heat, 3-4 units of heat are produced, making it an efficient way of heating a building. If grid electricity is used for the compressor and pump, then you should consult a range of energy suppliers to benefit from the lowest running costs, for example by choosing an economy 10 or economy 7 tariff.

Ground source heat pumps



How it works

There are three important elements to a ground source heat pump:

1. **The ground loop**

This is comprised of lengths of pipe buried in the ground, either in a borehole or a horizontal trench. The pipe is usually a closed circuit and is filled with a mixture of water and antifreeze, which is pumped around the pipe absorbing heat from the ground. The ground loop can be:

- Vertical, for use in boreholes
- Horizontal, for use in trenches
- Spiral, coil or 'slinky', also for use in trenches

2. **A heat pump**

In the same way that your fridge uses refrigerant to extract heat from the inside, keeping your food cool, a ground source heat pump extracts heat from the ground, and uses it to heat your home. A ground source heat pump has three main parts:

- The evaporator, (e.g. the squiggly thing in the cold part of your fridge) absorbs the heat using the liquid in the ground loop;
- The compressor, (this is what makes the noise in a fridge) moves the refrigerant round the heat pump and compresses the gaseous refrigerant to the temperature needed for the heat distribution circuit;
- The condenser, (the hot part at the back of your fridge) gives up heat to a hot water tank which feeds the distribution system.

3. Heat distribution system

This consists of under floor heating or radiators for space heating and in some cases water storage for hot water supply.

You should consider the following issues if you're thinking about installing a ground source heat pump. An accredited installer will be able to provide more detailed advice.

- You will need space outside your house for the ground loop.
- The ground will need to be suitable for digging a trench or borehole.
- What fuel is being replaced? If it's electricity, oil, LPG or coal the savings will be more favourable than gas. Heat pumps are a good option where gas is unavailable.
- The type of heat distribution system. Ground source heat pumps can be combined with radiators but these will normally be larger than with standard boiler systems. Under floor heating is better as it works at a lower temperature.
- Want to further reduce your home's carbon dioxide emissions? Install solar PV or some other form of renewable electricity generating system to power the compressor and pump.
- Is the system for a new building development? Combining the installation with other building works can reduce costs.

Air and water source heat pumps

Air and water source heat pumps use air or water respectively. They do not rely on a collection system and simply extract the heat from the source at the point of use.

Air source heat pumps can be fitted outside a house or in the roof space and generally perform better at slightly warmer air temperatures. Water source heat pumps can be used to provide heating in homes near to rivers, streams, lakes and lochs for example.

Costs and savings

A typical 8 - 12kW system costs £6,000 - £12,000 (not including the price of distribution system). This can vary with property and location. When installed in an electrically heated home a ground source heat pump could save as much as £880 a year on heating bills and almost 7 tonnes of carbon dioxide a year. Savings will vary depending on what fuel is being replaced.

Phase 1 - Householder Stream.

At present, grants are available for non-reversible closed loop systems, utilising a borehole or trenches. A grant of up to £1,200 is available for domestic systems. For details of how to apply for grants, and of energy efficiency measures that must be in place before the grant can be accessed, please visit www.lowcarbonbuildings.org.uk.

Phase 2 - Community Stream.

Phase 2 of the LCBP is for the installation of micro generation technologies in public sector buildings (including schools, hospitals, housing associations and local authorities) and charitable bodies. Grants are available for up to 50% for installations with a maximum of £30,000. Phase 2 is administered by the BRE, for further information please visit www.lowcarbonbuildingsphase2.org.uk.

4.8 CHP

Combined heat and power (Chp) and Micro combined heat and power (Micro Chp)
CHP (combined heat and power) earlier CHP units where basically diesel engines converted to run on oil or gas, electricity been the primary output and heat been the secondary.
They have been around for many years, but mainly used in larger buildings like hotels and large blocks of flats etc. For CHP systems to be economically viable they need to run for at least 4,000 hours per year. They are more suitable for leisure centres with swimming pools and hospitals that have a high, year round heat demand or in mixed use developments with suitable heat demands However, new housing or office developments may be able to make use of existing CHP schemes nearby

Fuel types for Chp / Micro Chp

Natural Gas

Micro CHP units are currently being developed for the domestic market by Potterton Baxi, and Powergen (Whispergen) and it shouldn't be long before they become commercially available.
Micro CHP boilers work using similar principle to their older commercial counterparts, an engine produces heat and electricity, the heat is used in the home much like heat from a conventional boiler and the electricity is either used in the home or exported into the national grid.

Typical estimated boiler efficiencies for use with natural gas

100% Gas	78% heat
	12% electricity
	10% waste

Biogas

Biogas typically refers to a gas produced by the biological breakdown of organic matter in the absence of oxygen. Biogas originates from biogenic material and is a type of bio fuel. One type of biogas is produced by anaerobic digestion or fermentation of biodegradable materials such as biomass, manure or sewage, municipal waste, and energy crops. This type of biogas comprises primarily methane and carbon dioxide. The other principal type of biogas is wood gas which is created by gasification of wood or other biomass. This type of biogas is comprised primarily of nitrogen, hydrogen, and carbon monoxide, with trace amounts of methane. The gases methane, hydrogen and carbon monoxide can be combusted or oxidized with oxygen. Air contains 21% oxygen. This energy release allows biogas to be used as a fuel. Biogas can be used as a low-cost fuel in any country for any heating purpose, such as cooking. It can also be utilized in modern waste management facilities where it can be used to run any type of heat engine, to generate either mechanical or electrical power. Biogas is a renewable fuel and electricity produced from it can be used to attract renewable energy subsidies in some parts of the world.

Bio Mass

(Please see previous description)

4.9 Fuel Cells

In principle, a fuel cell operates like a battery. Unlike a battery, a fuel cell does not run down or require recharging. It will produce energy in the form of electricity and heat as long as fuel is supplied.

A fuel cell consists of two electrodes sandwiched around an electrolyte. Oxygen passes over one electrode and hydrogen over the other, generating electricity, water and heat.

A fuel cell produces electricity.

The fuel cell is similar to a battery. It produces electricity using chemicals. The chemicals are usually very simple, often just hydrogen and oxygen. In this case the hydrogen is the "fuel" that the fuel cell uses to make electricity.

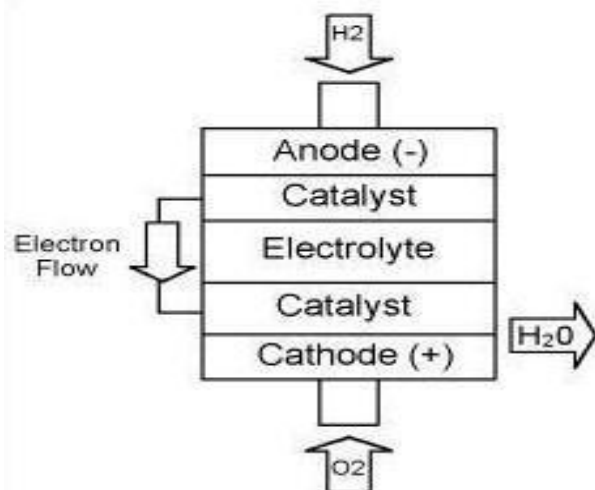
Another very important difference is that fuel cells do not run down like batteries. As long as the fuel and oxygen is supplied to the cell it will keep producing electricity for ever.

The oxygen needed by a fuel cell is usually simply obtained from air.

Although the majority of fuel cells use hydrogen as the fuel, some fuel cells work off methane, and a few use liquid fuels such as methanol.

Fuel cells that use hydrogen can be thought of as devices that do the reverse of the well-known experiment where passing an electric current through water splits it up into hydrogen and oxygen. In the fuel cell hydrogen and oxygen are joined together to produce water and electricity.

Fuel cells can be made in a huge range of sizes. They can be used to produce quite small amounts of electric power, for devices such as portable computers or radio transmitters, right up to very high powers for electric power stations.



Hydrogen fuel is fed into the "anode" of the fuel cell. Oxygen (or air) enters the fuel cell through the cathode. Encouraged by a catalyst, the hydrogen atom splits into a proton and an electron, which take different paths to the cathode. The proton passes through the electrolyte. The electrons create a separate current that can be utilized before they return to the cathode, to be reunited with the hydrogen and oxygen in a molecule of water.

A fuel cell system which includes a "fuel reformer" can utilize the hydrogen from any hydrocarbon fuel - from natural gas to methanol, and even gasoline. Since the fuel cell relies on chemistry and not combustion, emissions from this type of a system would still be much smaller than emissions from the cleanest fuel combustion processes.

FUEL CELLS USING HYDROGEN FROM RENEWABLE SOURCES

Fuel cells can be used as CHP systems in buildings. There are currently several different systems under development using different chemical processes, which operate at different temperatures. They currently use natural gas as the fuel, which is 'reformed' to produce hydrogen, the required fuel for the fuel cell. When and if hydrogen becomes available from renewable sources, e.g. as the storage medium of wind generated energy, fuel cell CHP from renewable sources may be possible in buildings.

5 Innovative technologies

The following technologies are not yet classified as LDC technologies; in reality they provide a large reduction in both CO₂ emissions and provide a good end user benefit in terms of energy savings. This list of technologies will expand over the following years, and this section will expand to include any new available innovative technologies.

5.1 Flue Gas Heat Recovery Systems (FGHRS)



The Flue Gas Heat Recovery System is not considered as a low carbon technology although it will be included in a draft consultation by the Energy Saving Trust.

In reality the FGHRS provides a good reduction in CO₂ emissions compared to some technologies that are classified and listed as LDC technologies yet do not provide a reduction in CO₂ emissions when compared to a Natural Gas energy model.

Background

Condensing combination boilers only condense when the flow and return water temperature differential is large enough, generally 11°C, during hot water mode the primary heating water is just circulated around the boiler through a secondary heat exchanger and the temperature differential between flow and return water will be very low and therefore the boiler will not condense.

How it works

The FGHRS is fitted above the boiler and is connected to the boiler flue outlet; the flue is terminated from the FGHRS as normal.

Cold mains water enters the FGHRS and is pre heated by the waste flue gasses via an air to water heat exchanger, the preheated water is then feed to the inlet cold connection on the boiler therefore reducing the amount of gas required to heat the hot water to a sufficient usable temperature.

Costs and maintenance

FGHRS cost between £500-£650 and according to the manufacture will require none or very little maintenance.

Land use

FGHRS requires no specific land use requirements.

Planning

FGHRS require no additional planning requirements.

5.2 Waste Water Heat Recovery Systems (WWHRs)

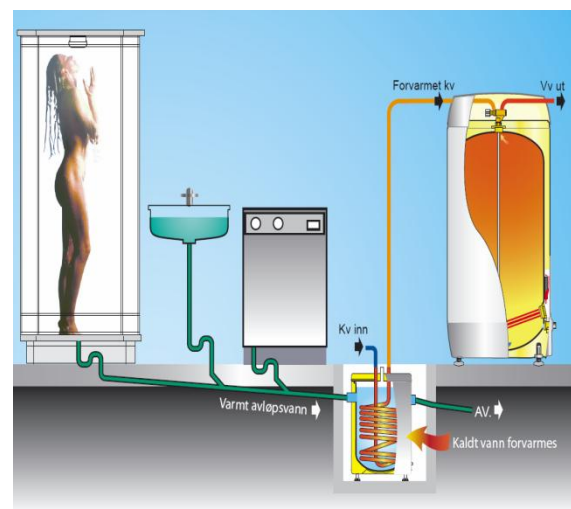
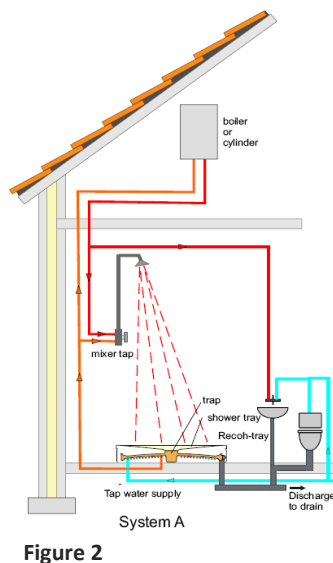
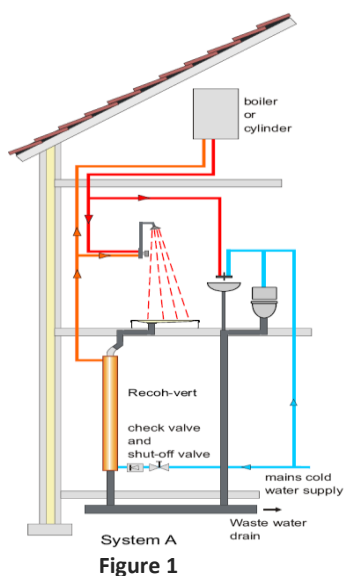


Figure 3

Shower Saver (figure 1 & 2)

Waste Water Heat Recovery Systems (WWHRs) are new to the UK and Appendix Q, following successful experience in The Netherlands where they are fitted to 20% of new dwellings. Although generically classified as a WWHRs the Shower-Save device is primarily applicable to heat recovery from warm shower waste water. Figure 7 shows the most common configuration known as Reco-vert, applicable to upstairs showers, whilst Figure 8 shows the Reco-h-tray which can be used in apartments, bungalows or other single storey properties. The principle of heat recovery is the same in both cases:

Warm shower water passes through the 'grey' water side of a copper counter-flow heat exchanger. Mains pressure water simultaneously passes through the fresh water side of the heat exchanger, where it is pre-heated before passing into both the 'cold' inlet of the mixer shower and the 'cold' inlet to the hot water cylinder, combi boiler or other water heater.

The use of pre-heated water (orange line in Figures 1 and 2) reduces the total volume of hot water required per shower, whilst also pre-heating the cold feed to the hot water heater which increases potential flow rates for combi or shortens the re-heat time of cylinders.

The energy saving applies to whichever fuel is used for water heating, which is therefore not limited solely to gas boilers.

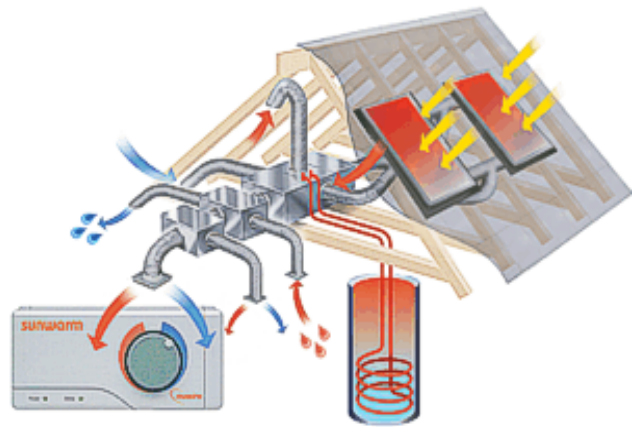
Whilst technically applicable to instantaneous electric showers, these aren't currently modelled by SAP, so it is not possible to apply in Appendix Q either.

Does not save energy from baths, in which hot water use is in advance of grey water disposal, but is applicable to the shower over a bath.

Waste water heat recovery System

Figure 3 depicts a whole house Waste Water Heat Recovery System (WWHRs) which is being developed in the Netherlands and is expected to be available in this country during the next year. It is estimated that the system will provide a reduction in energy consumption of approximately 2500Kw pa or approximately 475 Kg/ CO₂ pa for an average dwelling.

5.3 Sunwarm



The Sunwarm System developed by Nuaire could be classified as a LZC technology and was listed on the DTI clear skies renewable energy grant scheme, the technology has been included in this innovative section subject to confirmation of its exact classification.

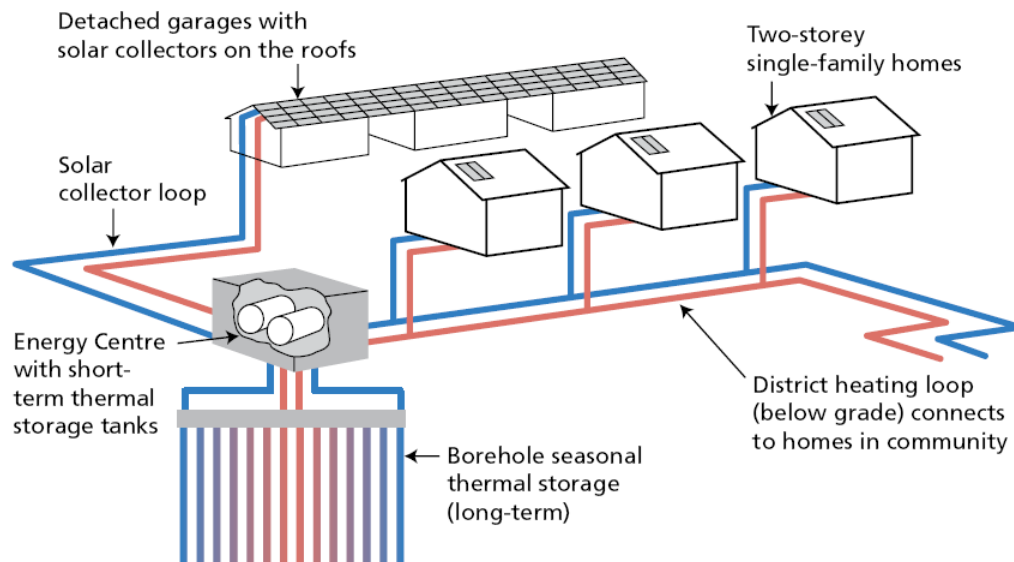
The Sunwarm system is a system that uses solar radiation in the same way Solar thermal uses solar radiation to heat water, the Sunwarm system uses solar radiation to heat air which is then introduced through the ventilation ducting and into the dwelling, the Sunwarm system can also be used to heat water by way of an air to water heat exchanger.

The unit is in the process of being tested by the BRE and will be eventually included in the appendix Q database.

The manufactures claim that the energy saved by the unit as assessed over a winter period will be approximately 1500 Kw and therefore the unit should provide in excess 1500 Kw if assessed over the full year. For the purpose of this feasibility assessment the conservative figure of 1500Kw has been used in the calculation process although this may change when the unit has been entered on the appendix Q database

5.4 Geothermal Storage

Solar Seasonal Storage and District Loop



Geothermal storage systems are and are intended to be used in conjunction with Solar thermal or PV-T systems. The heat produced by both systems can be stored in boreholes in the ground and the heat can then be used throughout the winter period to provide heating through community heating circuits.

The concept was conceived by the Canadian Government and implemented at Drake Landing Okotoks, Alberta, Canada and has successfully integrated the technology and an unlimited solar energy supply feeding 52 homes.

Borehole thermal energy storage allowed water to be heated and collected in large quantities for use in winter, at the end of summer the water was measured to reach temperatures of 80°C and even at the low temperatures associated with the Canadian winters the water temperature at the end of the winter period had been measured at 50°C.

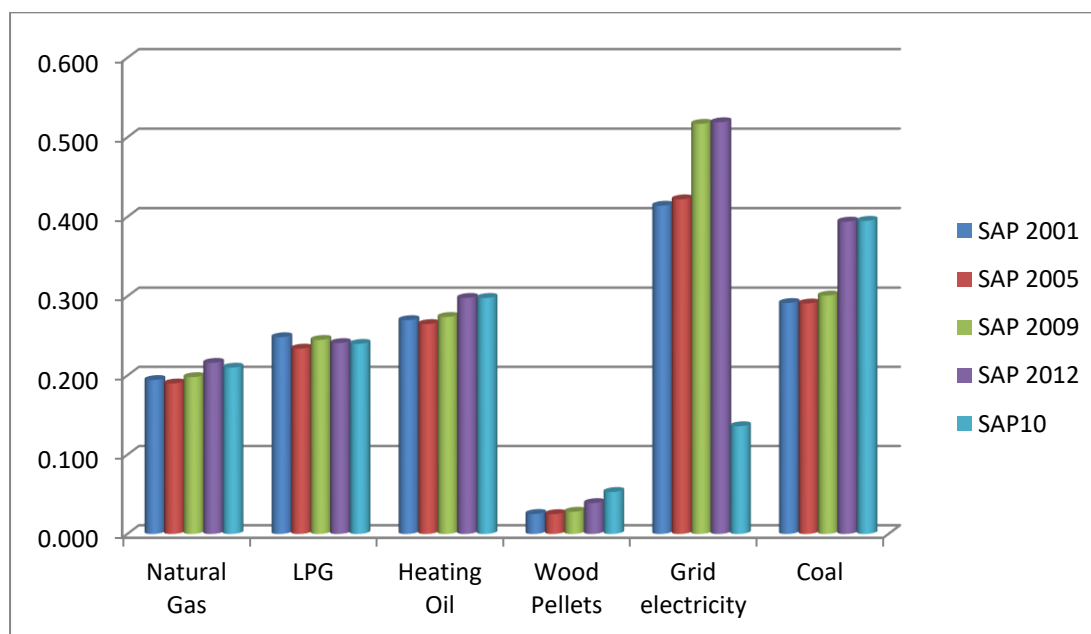
Currently there is no way of assessing the benefit of the Geothermal storage system because of limited test data and therefore the system has not been considered further in this study.

For more information on the Drake landing Solar community please visit www.dlsc.ca

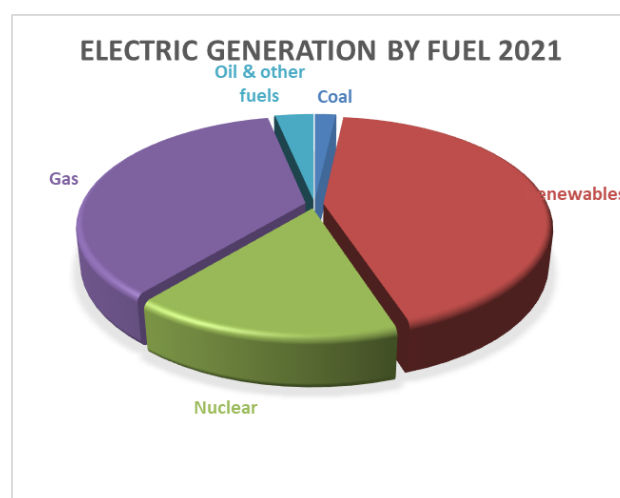
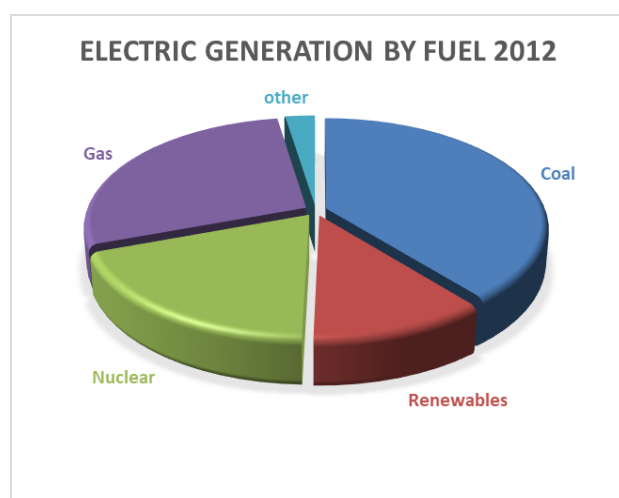
6 Fuel Cost and Carbon

Carbon

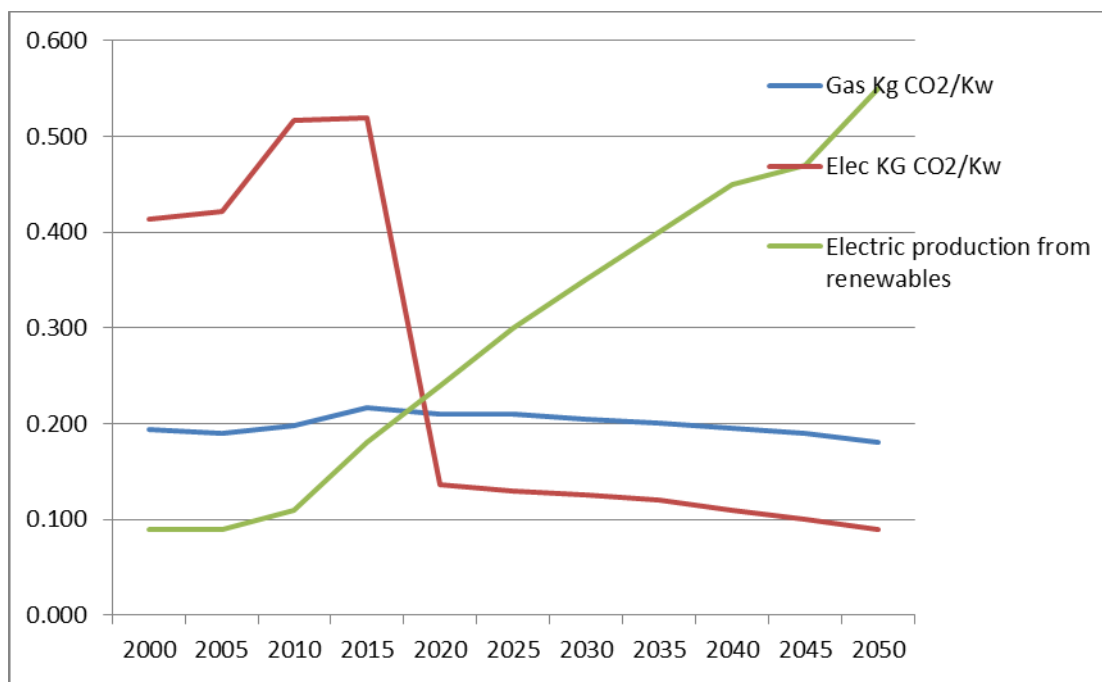
Carbon factors including SAP10.1 estimate, due to the decarbonisation of the grid electricity is now the low carbon fuel



It can be seen that electric generation from renewable technologies has increased as well as a marked reduction in generation from coal however as a consequence the share of electric production from gas has also increased.

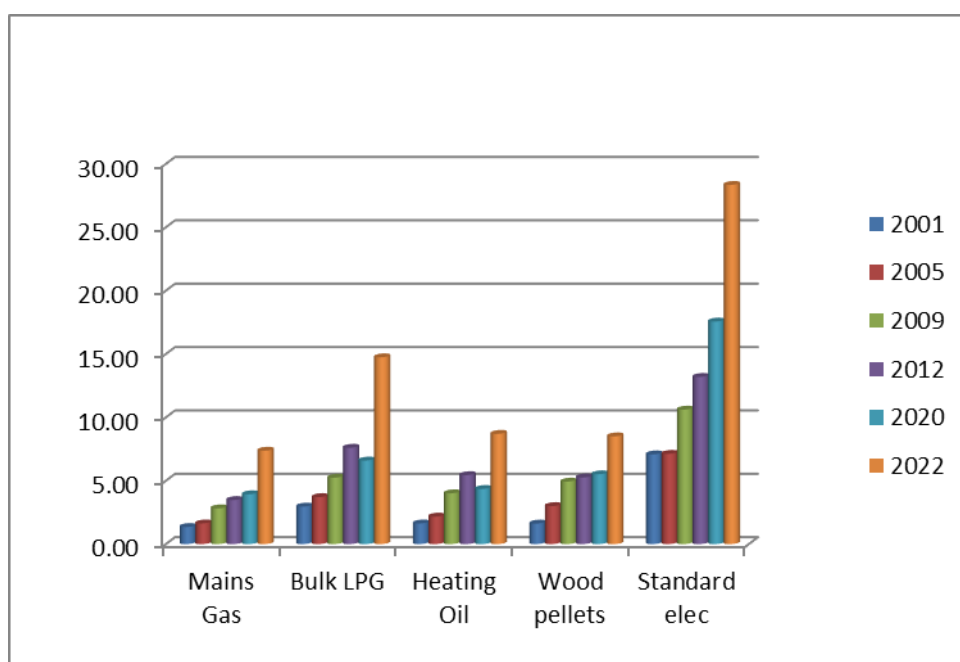


The following graph represents an estimate of CO2 emissions for both gas and electricity and how they may change over the following years; data has been taken from SAP 2001, 2005, 2009, 2012 and SAP10.1 documents.



Running costs

Electricity is the greener fuel although it is also the most expensive fuel, technologies which high efficiencies which further reduce carbon as well as running costs would be preferred.



7 Excluded technology

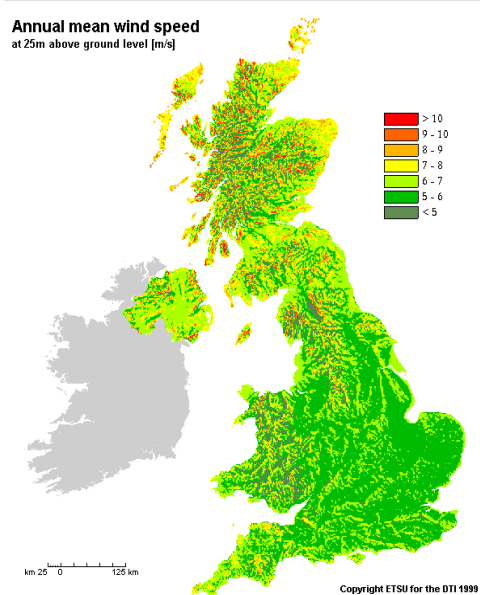
Low or Zero Carbon technologies and other innovative technologies not thought appropriate for use at the proposed development.

- Large Mast Wind turbines
- Small scale hydro power
- Solar thermal
- Waste heat from processes such as large scale power generation where the majority of heating comes from waste heat
- Other technologies, Fuel cells using hydrogen from any of the above renewable sources

LZC technology and reasons for their exclusion

Wind turbines

The UK Department of Trade and Industry used to publish a database of average wind speed data for every 1km grid square in the country, known as the NOABL database. The database no longer appears on the DTI website. The data is estimated rather than measured, and takes no account of local features such as walls, buildings, trees and hilltops, which occur at a scale of much less than 1km. These features make a major difference to the wind. To quote the DTI web page: "The data can only be used as a guide and should be followed by on-site measurements for a proper assessment".



In any case, average wind speed is not a reliable predictor of wind turbine output, because the relationship between wind speed and power output is not linear. For example, compare two days: one when the wind blows steadily at 8 mph all day, and another when the wind blows at 16 mph for 12 hours and there is no wind at all for the other 12 hours. Both days have an average wind speed of 8mph, but most turbines would produce more than twice as much power on the second day. One way to approach the problem is to embark on complex statistical calculations involving the 'Rayleigh wind speed distribution'; a simpler method is to carry out a wind survey in the exact spot where the turbine is to be mounted. The average wind speed for the proposed development is **5 meters per second**, 10 meters above ground level according to the NOABL database; therefore large mast wind turbines may be suitable for use at the proposed site. As previously indicated a detailed on-site assessment to establish the actual average wind speed would be required to determine the potential suitability of the site for the installation of a large mast wind turbine although it is thought that the land use requirements would be Impractical.

5.2	5	4.6
5	5	4.6
4.6	4.8	4.9

<http://www.renew-reuse-recycle.com/noabl.pl?n=503>

Small scale hydro power

Small scale hydro would be inappropriate for integration into the proposed development due to the geographical location of the proposed site and its increased proximity to a natural water feature which would be capable of accommodating this type of technology.

Biomass

As well as the increase in running costs and energy use the fuel would need to be delivered to site and there would be a certain degree of organisation required to source the fuel and arrange for delivery which may cause inconvenience on part of the occupier and or housing management team.

Biomass boilers are very efficient and produce very little waste products even so there would be a requirement to remove and dispose of burnt spent fuel frequently.

The Clean Air Acts of 1956 and 1968 were introduced to deal with the smog's of the 1950s and 1960s which were caused by the widespread burning of coal for domestic heating and by industry. This smog's were blamed for the premature deaths of hundreds of people in the UK. The Acts gave local authorities powers to control emissions of dark smoke, grit, dust and fumes from industrial premises and furnaces and to declare "smoke control areas" in which emissions of smoke from domestic properties are banned. Since then, smoke control areas have been introduced in many of our large towns and cities in the UK and in large parts of the Midlands, North West, South Yorkshire, North East of England, Central and Southern Scotland. The implementation of smoke control areas, the increased popularity of clean natural gas and the changes in the industrial and economic structure of the UK lead to a substantial reduction in concentrations of smoke and associated levels of sulphur dioxide (SO₂) between the 1950s and the present day.

Pollutants associated with biomass combustion include particulate matter (PM₁₀/PM_{2.5}) and nitrogen oxides (NO_x) emissions. These pollution emissions can have an impact on local air quality and affect human health, a report provided by DEFRA concluded that the negative effects on air quality associated with biomass primary installations especially in urban developments could out way any benefit associated with CO₂ reduction.

A permit would be required which would need to be purchased from the local authority and the local authority could refuse or revoke licence at any time in the future.

It is considered that Bio Mass would not be suitable for integration at the proposed development for these reasons.

From wasted heat

Community heating including utilising waste heat from processes such as large scale power generation or industrial heat generation where the majority of heating comes from waste heat would be inappropriate for integration at the proposed development due to the geographical location of the proposed site and its increased proximity to an industrial heating or power generation source that would be capable of supporting this type of technology.

Specific details relating to the new commercial / retail element of the scheme is so far unknown, energy from wasted heat from use of these building may be able to contribute towards the heat requirements of residential units and this should be considered in greater detail once this information becomes available.

Other technologies

Fuel cell etc, not yet fully commercially available.

8 Suitable technologies

The following Low or Zero carbon technologies and innovative technologies are to be considered in more detail for integration at the proposed development.

- Solar Photovoltaic
- Air Source or Ground Source Heat Pump (ASHP & GSHP)

High efficiency technologies such as Ground and Air Source Heat pumps will have the largest effect on Carbon reduction and Primary Energy reduction.

Microgeneration technologies including Photovoltaic technology if coupled with battery storage will have the largest benefit in reducing occupiers running costs and reducing Primary Energy.

Heat Pump Technologies and Solar Photovoltaic technologies are both considered suitable for integration at the proposed development.

9 Bibliography and definitions

DCLG

<http://www.communities.gov.uk/corporate/>

Energy Saving Trust

<http://www.energysavingtrust.org.uk/>

Building Research Establishment (BRE)

<http://www.bre.co.uk/>

Code for Sustainable Homes (CSH) version 2 revised May 2009 incorporating 2014 addendum

<http://www.bre.co.uk/>

London Tool Kit 2004

SAP 2012 version 9.92 (BRE)

<http://projects.bre.co.uk/sap2012/>

Business Enterprise and Regulatory Reform (BERR)

Planning Portal

<http://www.planningportal.gov.uk/>

Department for Environment Food and Rural Affairs

DEFRA

<http://www.defra.gov.uk/>

NOABL database

BERR

<http://www.berr.gov.uk/whatwedo/energy/sources/renewables/explained/wind/windspeed-database/page27326.html>

SAP	Standard Assessment Procedure
ENE 1	Energy 1
ENE 7	Energy 7
SAP	Standard Assessment Procedure
LZC	Low or Zero Carbon Technology
CSH	Code for Sustainable Homes
EI	Environmental Impact
FIT	Feed in Tariffs
RHI	Renewable Heat Incentives
DER	Dwelling Emission Rate
TER	Target Emission Rate
DNO	District Network Operator
PV	Photovoltaic
CHP	Combined Heat and Power
AD	Anaerobic Digestion
ASHP	Air Source Heat Pump
GSHP	Ground Source Heat Pump

10 Appendix A

Sample SAP calculations for each house type

- HL962-Mid
 - HL962-Semi/End
 - HL698-Det
 - HL698-Semi
 - HL834-Mid
 - HL834-Semi/End
 - HL1265-Det
-
- Dwelling Emission Rate (DER)
 - Target Emission Rate (TER)
 - Dwelling Fabric Energy Efficiency (DFEE)
 - Target Fabric Energy Efficiency (TFEE)
 - Dwelling Primary Energy Rate (DPER)
 - Target Primary Energy Rate (TPER)
 - Predictive Energy Assessment (PEA)
 - Energy Report (ER)

Full SAP Calculation Printout



Property Reference	APT-00			Issued on Date	07/05/2025
Assessment Reference	001	Prop Type Ref			
Property	Highmoor Lane, CLECKHEATON, BD19 6LW				
SAP Rating	93 A	DER	10.94	TER	11.97
Environmental	92 A	% DER < TER			8.60
CO ₂ Emissions (t/year)	0.66	DFEE	30.20	TFEE	31.65
Compliance Check	See BREL	% DFEE < TFEE			4.58
% DPER < TPER	7.83	DPER	57.67	TPER	62.57
Assessor Details	Mr. Paul Goddard			Assessor ID	B342-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	61.8300 (1b)	2.3100 (2b)	142.8273 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.8300		142.8273 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 142.8273 (5)

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000	(17)
Infiltration rate	0.2000	(18)
Number of sides sheltered	2	(19)

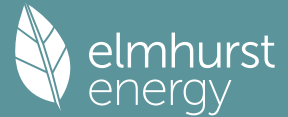
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1700 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			2.1600	1.0000	2.1600		(26)
Window			6.9400	1.1450	7.9466		(27)
Patio Door			5.5700	1.3258	7.3845		(27)
GF			61.8300	0.1100	6.8013	9.0000	556.4700 (28a)
Main	49.2261	14.6700	34.5561	0.1800	6.2201	18.0000	622.0098 (29a)
Total net area of external elements Aum(A, m ²)			111.0561				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 30.5124		(33)
Main dwelling							
Party Wall 1			32.0900	0.0000	0.0000	20.0000	641.8000 (32)
Party Ceiling 1			61.8300			20.0000	1236.6000 (32b)
Internal Wall 1			107.9200			75.0000	8093.9999 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 11150.8796 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							180.3474 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	

Full SAP Calculation Printout



E2 Other lintels (including other steel lintels)						9.1000		0.0500		0.4550		
E3 Sill						9.1000		0.0500		0.4550		
E4 Jamb						15.9000		0.0500		0.7950		
E5 Ground floor (normal)						21.3100		0.1000		2.1310		
E7 Party floor between dwellings (in blocks of flats)						21.3100		0.0700		1.4917		
E16 Corner (normal)						4.6200		0.0900		0.4158		
E18 Party wall between dwellings						4.6200		0.0600		0.2772		
P1 Party wall - Ground floor						13.8900		0.0800		1.1112		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											7.1319	(36)
Point Thermal bridges											0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	37.6443 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	23.5665	23.5665	23.5665	23.5665	23.5665	23.5665	23.5665	23.5665	23.5665	23.5665	23.5665	23.5665
Average = Sum(39)m / 12 =	61.2108	61.2108	61.2108	61.2108	61.2108	61.2108	61.2108	61.2108	61.2108	61.2108	61.2108	61.2108
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9900	0.9900	0.9900	0.9900	0.9900	0.9900	0.9900	0.9900	0.9900	0.9900	0.9900	0.9900
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.0329 (42)
Hot water usage for mixer showers												
Hot water usage for baths	58.3042	57.4280	56.1512	53.7083	51.9055	49.8950	48.7523	50.0194	51.4084	53.5670	56.0624	58.0808 (42a)
Hot water usage for other uses	25.1959	24.8218	24.2948	23.3232	22.5957	21.7890	21.3533	21.8765	22.4462	23.3094	24.3010	25.1108 (42b)
Average daily hot water use (litres/day)	35.4487	34.1596	32.8706	31.5815	30.2925	29.0035	29.0035	30.2925	31.5815	32.8706	34.1596	35.4487 (42c)
												109.3412 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	118.9488	116.4094	113.3166	108.6131	104.7937	100.6875	99.1090	102.1884	105.4362	109.7471	114.5231	118.6403 (44)
Energy content (annual)	188.3859	165.7654	174.1634	148.6858	141.0724	123.8070	119.8637	126.5306	130.0134	148.9257	163.1592	185.7620 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	28.2579	24.8648	26.1245	22.3029	21.1609	18.5710	17.9796	18.9796	19.5020	22.3389	24.4739	27.8643 (46)
Total storage loss												
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	1.7779	1.6107	1.7516	1.5723	1.5510	1.4171	1.3662	1.4274	1.4203	1.5562	1.6193	1.7595 (59)
Total heat required for water heating calculated for each month												
WWHRS	190.1638	167.3762	175.9150	150.2581	142.6235	125.2241	121.2299	127.9580	131.4336	150.4820	164.7784	187.5214 (62)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
Solar input	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
12Total per year (kWh/year)												
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 =												1835 (64)
Heat gains from water heating, kWh/month	63.0828	55.5197	58.3472	49.8311	47.2944	41.5201	40.1962	42.4283	43.5845	49.9069	54.6552	62.2057 (65)

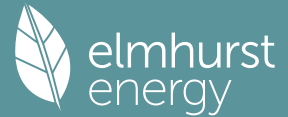
5. Internal gains (see Table 5 and 5a)												

Metabolic gains (Table 5), Watts												
(66)m	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	90.0731	99.7238	90.0731	93.0756	90.0731	93.0756	90.0731	90.0731	93.0756	90.0731	93.0756	90.0731 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	177.5375	179.3798	174.7373	164.8540	152.3781	140.6525	132.8190	130.9767	135.6192	145.5026	157.9785	169.7041 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644 (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)	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150 (71)
Water heating gains (Table 5)	84.7887	82.6186	78.4237	69.2099	63.5677	57.6668	54.0272	57.0273	60.5340	67.0791	75.9101	83.6098 (72)
Total internal gains	408.8925	418.2153	399.7273	383.6326	362.5120	344.8880	330.4125	331.5703	342.7220	359.1480	383.4572	399.8802 (73)

6. Solar gains												

[Jan]												
	Area											
	m2											
	Solar flux											
	Table 6a											
	W/m2											
	Specific data											
	or Table 6b											
	g											
	Specific data											
	or Table 6c											
	FF											
	Access											
	factor											
	Table 6d											
	Gains											
	W											
Northeast	3.5600											10.2065 (75)
Southeast	1.3600											12.7151 (77)
Southwest	2.0200											18.8856 (79)
Southwest	5.5700											62.6328 (79)
Solar gains	104.4400	181.2902	257.0541	333.5961	387.4322	390.6905	374.1454	333.0548	283.4156	202.7922	125.7124	88.9794 (83)
Total gains	513.3325	599.5055	656.7813	717.2287	749.9442	735.5785	704.5579	664.6251	626.1376	561.9402	509.1697	488.8596 (84)

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7. Mean internal temperature (heating season)

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

21.0000 (85)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	50.6032	50.6032	50.6032	50.6032	50.6032	50.6032	50.6032	50.6032	50.6032	50.6032	50.6032	50.6032
alpha	4.3735	4.3735	4.3735	4.3735	4.3735	4.3735	4.3735	4.3735	4.3735	4.3735	4.3735	4.3735
util living area	0.9749	0.9521	0.9131	0.8267	0.6882	0.5162	0.3787	0.4179	0.6299	0.8609	0.9546	0.9793 (86)
MIT	19.7948	20.0422	20.3351	20.6589	20.8772	20.9722	20.9942	20.9912	20.9355	20.6470	20.1575	19.7306 (87)
Th 2	20.0917	20.0917	20.0917	20.0917	20.0917	20.0917	20.0917	20.0917	20.0917	20.0917	20.0917	20.0917 (88)
util rest of house	0.9695	0.9425	0.8959	0.7948	0.6375	0.4488	0.3022	0.3380	0.5610	0.8272	0.9437	0.9748 (89)
MIT 2	18.7018	19.0102	19.3699	19.7508	19.9862	20.0738	20.0893	20.0877	20.0457	19.7474	19.1588	18.6210 (90)
Living area fraction									fLA = Living area / (4) =			0.3087 (91)
MIT	19.0393	19.3288	19.6679	20.0311	20.2613	20.3512	20.3687	20.3667	20.3204	20.0252	19.4672	18.9636 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.8893	19.1788	19.5179	19.8811	20.1113	20.2012	20.2187	20.2167	20.1704	19.8752	19.3172	18.8136 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9602	0.9304	0.8832	0.7866	0.6386	0.4571	0.3130	0.3491	0.5672	0.8181	0.9320	0.9664 (94)
Useful gains	492.9135	557.8005	580.0612	564.1542	478.9499	336.2475	220.5383	232.0501	355.1629	459.6996	474.5287	472.4402 (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	893.0229	874.0189	796.8359	672.1642	514.8639	342.8528	221.5032	233.6209	371.5747	567.7404	747.8229	894.5111 (97)
Space heating kWh	297.6814	212.4988	161.2804	77.7672	26.7200	0.0000	0.0000	0.0000	0.0000	80.3824	196.7719	314.0208 (98a)
Space heating requirement - total per year (kWh/year)												1367.1228
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	297.6814	212.4988	161.2804	77.7672	26.7200	0.0000	0.0000	0.0000	0.0000	80.3824	196.7719	314.0208 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1367.1228
Space heating per m2										(98c) / (4) =		22.1110 (99)

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

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

0.0000 (201)

Fraction of space heat from main system(s)

1.0000 (202)

Efficiency of main space heating system 1 (in %)

88.7000 (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	297.6814	212.4988	161.2804	77.7672	26.7200	0.0000	0.0000	0.0000	0.0000	80.3824	196.7719	314.0208 (98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)
Space heating fuel (main heating system)	335.6047	239.5702	181.8268	87.6744	30.1240	0.0000	0.0000	0.0000	0.0000	90.6227	221.8397	354.0257 (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	190.1638	167.3762	175.9150	150.2581	142.6235	125.2241	121.2299	127.9580	131.4336	150.4820	164.7784	187.5214 (64)
Efficiency of water heater (217)m	83.3690	82.7211	81.7074	80.0472	77.9329	76.2000	76.2000	76.2000	76.2000	80.1318	82.5298	76.2000 (216)
Fuel for water heating, kWh/month	228.0988	202.3380	215.2987	187.7119	183.0081	164.3361	159.0943	167.9239	172.4851	187.7930	199.6593	224.3774 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	9.7777	8.8315	9.7777	9.4623	9.7777	9.4623	9.7777	9.7777	9.4623	9.7777	9.4623	9.7777 (231)
Lighting	21.0653	16.8993	15.2160	11.1479	8.6109	7.0352	7.8552	10.2105	13.2624	17.4010	19.6544	21.6507 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-24.0719	-35.5797	-53.7175	-62.8994	-69.4846	-65.4486	-64.6025	-60.1394	-52.2505	-41.8083	-26.9679	-20.5640 (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	-11.1932	-24.8755	-52.8193	-83.9346	-114.5984	-116.4248	-114.5065	-94.7226	-66.3264	-36.5152	-15.1953	-8.7126 (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												1541.2884 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												76.2000
Water heating fuel used												2292.1246 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:

(MEVDecentralised, Database: total watage = 3.5100, total flow = 21.0000, SFP = 0.1671)

mechanical ventilation fans (SFP = 0.1671)

29.1245 (230a)

central heating pump

41.0000 (230c)

main heating flue fan

45.0000 (230e)

Total electricity for the above, kWh/year

115.1245 (231)

Electricity for lighting (calculated in Appendix L)

170.0087 (232)

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

PV generation	-1317.3590 (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	2801.1873 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1541.2884	0.2100	323.6706 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2292.1246	0.2100	481.3462 (264)
Space and water heating			805.0167 (265)
Pumps, fans and electric keep-hot	115.1245	0.1387	15.9692 (267)
Energy for lighting	170.0087	0.1443	24.5375 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-577.5344	0.1338	-77.2467
PV Unit electricity exported	-739.8246	0.1245	-92.0930
Total			-169.3398 (269)
Total CO2, kg/year			676.1837 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.9400 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1541.2884	1.1300	1741.6559 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2292.1246	1.1300	2590.1008 (278)
Space and water heating			4331.7568 (279)
Pumps, fans and electric keep-hot	115.1245	1.5128	174.1604 (281)
Energy for lighting	170.0087	1.5338	260.7650 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-577.5344	1.4943	-862.9997
PV Unit electricity exported	-739.8246	0.4569	-337.9989
Total			-1200.9986 (283)
Total Primary energy kWh/year			3565.6835 (286)
Dwelling Primary energy Rate (DPER)			57.6700 (287)

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

CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

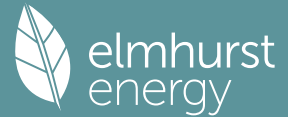
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	61.8300 (1b)	x 2.3100 (2b)	= 142.8273 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.8300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	142.8273 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1400 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3900 (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) = 0.3315 (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	0.4227	0.4144	0.4061	0.3647	0.3564	0.3149	0.3149	0.3067	0.3315	0.3564	0.3730	0.3895 (22b)
Effective ac	0.5893	0.5859	0.5825	0.5665	0.5635	0.5496	0.5496	0.5470	0.5550	0.5635	0.5696	0.5759 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.1600	1.0000	2.1600		(26)
TER Opening Type			12.5100	1.1450	14.3244		(27)
GF			61.8300	0.1300	8.0379		(28a)
Main	49.2261	14.6700	34.5561	0.1800	6.2201		(29a)
Total net area of external elements Aum(A, m2)			111.0561				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	30.7424	(33)
Main dwelling							
Party Wall 1			32.0900	0.0000	0.0000		(32)

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

190.3474 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.1000	0.0500	0.4550
E3 Sill	9.1000	0.0500	0.4550
E4 Jamb	15.9000	0.0500	0.7950
E5 Ground floor (normal)	21.3100	0.1600	3.4096
E7 Party floor between dwellings (in blocks of flats)	21.3100	0.0700	1.4917
E16 Corner (normal)	4.6200	0.0900	0.4158
E18 Party wall between dwellings	4.6200	0.0600	0.2772
P1 Party wall - Ground floor	13.8900	0.0800	1.1112

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

8.4105 (36)

Point Thermal Bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 39.1529 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	27.7771	27.6136	27.4534	26.7006	26.5598	25.9041	25.9041	25.7827	26.1567	26.5598	26.8447	27.1426
Heat transfer coeff	66.9301	66.7666	66.6063	65.8535	65.7127	65.0571	65.0571	64.9356	65.3096	65.7127	65.9976	66.2955
Average = Sum(39)m / 12 =												65.8529

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0825	1.0798	1.0772	1.0651	1.0628	1.0522	1.0522	1.0502	1.0563	1.0628	1.0674	1.0722
HLP (average)												1.0651
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

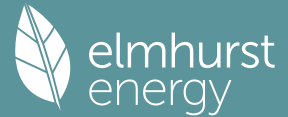
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0329 (42)
Hot water usage for mixer showers												
58.3042	57.4280	56.1512	53.7083	51.9055	49.8950	48.7523	50.0194	51.4084	53.5670	56.0624	58.0808	(42a)
Hot water usage for baths												
25.1959	24.8218	24.2948	23.3232	22.5957	21.7890	21.3533	21.8765	22.4462	23.3094	24.3010	25.1108	(42b)
Hot water usage for other uses												
35.4487	34.1596	32.8706	31.5815	30.2925	29.0035	29.0035	30.2925	31.5815	32.8706	34.1596	35.4487	(42c)
Average daily hot water use (litres/day)												109.3412 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	118.9488	116.4094	113.3166	108.6131	104.7937	100.6875	99.1090	102.1884	105.4362	109.7471	114.5231	118.6403 (44)
Energy conte	188.3859	165.7654	174.1634	148.6858	141.0724	123.8070	119.8637	126.5306	130.0134	148.9257	163.1592	185.7620 (45)
Energy content (annual)										Total = Sum(45)m =		1816.1345
Distribution loss (46)m = 0.15 x (45)m												
28.2579	24.8648	26.1245	22.3029	21.1609	18.5710	17.9796	18.9796	19.5020	22.3389	24.4739	27.8643	(46)
Water storage loss:												
Total storage loss												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.5048	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
239.3448	211.7928	225.1223	198.0009	192.0314	173.1221	170.3686	177.4895	179.3284	199.8846	212.4742	236.7209	(62)
WWHRS	-26.6543	-23.5732	-24.6845	-20.4398	-19.0491	-16.3005	-15.2791	-16.2478	-16.8651	-19.8821	-22.5240	-26.1607 (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	212.6905	188.2196	200.4378	177.5611	172.9822	156.8216	155.0895	161.2417	162.4633	180.0026	189.9502	210.5602 (64)
12Total per year (kWh/year)												2168.0203 (64)
Electric shower(s)												2168 (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												
75.3780	66.6239	70.6491	61.7668	59.6463	53.4946	52.4809	54.8111	55.5582	62.2575	66.5792	74.5056	(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	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	90.0731	99.7238	90.0731	93.0756	90.0731	93.0756	90.0731	90.0731	93.0756	90.0731	93.0756	90.0731 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	177.5375	179.3798	174.7373	164.8540	152.3781	140.6525	132.8190	130.9767	135.6192	145.5026	157.9785	169.7041 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644 (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)	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150 (71)
Water heating gains (Table 5)	101.3146	99.1426	94.9584	85.7872	80.1698	74.2980	70.5388	73.6709	77.1642	83.6795	92.4711	100.1419 (72)
Total internal gains	425.4183	434.7394	416.2620	400.2099	379.1141	361.5192	346.9241	348.2139	359.3521	375.7483	400.0183	416.4123 (73)

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6. Solar gains

[Jan]	Area m ²		Solar flux Table 6a W/m ²		Specific data or Table 6b		Specific data or Table 6c		FF Access factor Table 6d		Gains W	
Northeast	3.5600		11.2829		0.6300		0.7000		0.7700		12.2756	(75)
Southeast	1.3600		36.7938		0.6300		0.7000		0.7700		15.2928	(77)
Southwest	7.5900		36.7938		0.6300		0.7000		0.7700		85.3471	(79)
Solar gains	112.9155	196.4143	279.5731	364.5582	424.9053	429.1211	410.6854	364.5494	308.8289	219.9998	135.9893	96.1516 (83)
Total gains	538.3338	631.1537	695.8351	764.7681	804.0194	790.6402	757.6095	712.7633	668.1810	595.7481	536.0075	512.5639 (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	48.8453	48.9649	49.0827	49.6438	49.7502	50.2515	50.2515	50.3455	50.0572	49.7502	49.5354	49.3128
alpha	4.2564	4.2643	4.2722	4.3096	4.3167	4.3501	4.3501	4.3564	4.3371	4.3167	4.3024	4.2875
util living area	0.9764	0.9546	0.9162	0.8279	0.6874	0.5108	0.3744	0.4135	0.6291	0.8631	0.9563	0.9803 (86)
MIT	19.7153	19.9744	20.2870	20.6435	20.8726	20.9727	20.9943	20.9913	20.9339	20.6312	20.1187	19.6706 (87)
Th 2	20.0152	20.0173	20.0195	20.0295	20.0313	20.0401	20.0401	20.0417	20.0367	20.0313	20.0275	20.0236 (88)
util rest of house	0.9709	0.9447	0.8984	0.7940	0.6334	0.4400	0.2944	0.3300	0.5560	0.8276	0.9450	0.9757 (89)
MIT 2	18.5420	18.8666	19.2519	19.6781	19.9245	20.0232	20.0379	20.0381	19.9912	19.6769	19.0591	18.4918 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.9042	19.2086	19.5714	19.9762	20.2172	20.3164	20.3332	20.3324	20.2823	19.9716	19.3862	18.8557 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.9042	19.2086	19.5714	19.9762	20.2172	20.3164	20.3332	20.3324	20.2823	19.9716	19.3862	18.8557 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9629	0.9347	0.8888	0.7920	0.6443	0.4608	0.3190	0.3556	0.5754	0.8251	0.9357	0.9685 (94)
Useful gains	518.3697	589.9368	618.4714	605.6684	518.0051	364.3529	241.6965	253.4714	384.4739	491.5635	501.5611	496.4091 (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	977.4629	955.3385	870.6408	729.4069	559.6891	371.8899	242.8693	255.3515	403.7608	615.8303	810.8622	971.6083 (97)
Space heating kWh	341.5654	245.5500	187.6140	89.0917	31.0129	0.0000	0.0000	0.0000	0.0000	92.4545	222.6968	353.5482 (98a)
Space heating requirement - total per year (kWh/year)	1563.5335											
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	341.5654	245.5500	187.6140	89.0917	31.0129	0.0000	0.0000	0.0000	0.0000	92.4545	222.6968	353.5482 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1563.5335											
Space heating per m ²	(98c) / (4) = 25.2876 (99)											

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (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	341.5654	245.5500	187.6140	89.0917	31.0129	0.0000	0.0000	0.0000	0.0000	92.4545	222.6968	353.5482 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	369.5595	265.7467	203.0454	96.4196	33.5638	0.0000	0.0000	0.0000	0.0000	100.0590	241.0138	382.6280 (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	212.6905	188.2196	200.4378	177.5611	172.9822	156.8216	155.0895	161.2417	162.4633	180.0026	189.9502	210.5602 (64)
Efficiency of water heater (217)m	85.3906	84.9521	84.2399	82.9821	81.4986	80.3000	80.3000	80.3000	80.3000	83.0254	84.7232	80.3000 (216)
Fuel for water heating, kWh/month	249.0795	221.5596	237.9367	213.9753	212.2518	195.2946	193.1376	200.7991	202.3205	216.8041	224.2010	246.3189 (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	18.7154	15.0142	13.5186	9.9043	7.6504	6.2504	6.9789	9.0715	11.7830	15.4599	17.4619	19.2356 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-29.2039	-41.3195	-59.6204	-67.3259	-72.8775	-68.1578	-67.3418	-63.4468	-56.5991	-47.4015	-32.1683	-25.2334 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-16.0617	-33.8363	-67.3286	-101.2236	-133.9236	-134.5622	-132.9531	-112.5146	-82.4128	-48.3940	-21.4494	-12.6956 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												

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(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1692.1358	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2613.6787	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												151.0442	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1528.0514	(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												3014.8073	(238)

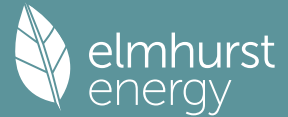
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1692.1358	0.2100	355.3485	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2613.6787	0.2100	548.8725	(264)
Space and water heating			904.2211	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	151.0442	0.1443	21.8003	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-630.6959	0.1345	-84.8228	
PV Unit electricity exported	-897.3555	0.1259	-112.9517	
Total			-197.7745	(269)
Total CO2, kg/year			740.1761	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.9700	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1692.1358	1.1300	1912.1135	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2613.6787	1.1300	2953.4569	(278)
Space and water heating			4865.5704	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	151.0442	1.5338	231.6766	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-630.6959	1.4970	-944.1831	
PV Unit electricity exported	-897.3555	0.4620	-414.6101	
Total			-1358.7931	(283)
Total Primary energy kWh/year			3868.5547	(286)
Target Primary Energy Rate (TPER)			62.5700	(287)

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Property Reference	APT-00			Issued on Date	07/05/2025
Assessment Reference	001	Prop Type Ref			
Property	Highmoor Lane, CLECKHEATON, BD19 6LW				
SAP Rating	93 A	DER	10.94	TER	11.97
Environmental	92 A	% DER < TER			8.60
CO ₂ Emissions (t/year)	0.66	DFEE	30.20	TFEE	31.65
Compliance Check	See BREL	% DFEE < TFEE			4.58
% DPER < TPER	7.83	DPER	57.67	TPER	62.57
Assessor Details	Mr. Paul Goddard			Assessor ID	B342-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	61.8300 (1b)	2.3100 (2b)	142.8273 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.8300		142.8273 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	142.8273 (5)

2. Ventilation rate

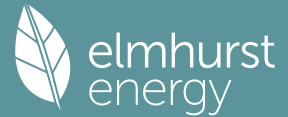
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1400 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3400 (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) = 0.2890 (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	0.3685	0.3613	0.3541	0.3179	0.3107	0.2746	0.2746	0.2673	0.2890	0.3107	0.3252	0.3396 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5679	0.5653	0.5627	0.5505	0.5483	0.5377	0.5377	0.5357	0.5418	0.5483	0.5529	0.5577 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			2.1600	1.0000	2.1600		(26)
Window			6.9400	1.1450	7.9466		(27)
Patio Door			5.5700	1.3258	7.3845		(27)
GF			61.8300	0.1100	6.8013	9.0000	556.4700 (28a)
Main	49.2261	14.6700	34.5561	0.1800	6.2201	18.0000	622.0098 (29a)
Total net area of external elements Aum(A, m ²)			111.0561				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	30.5124	(33)
Main dwelling							
Party Wall 1			32.0900	0.0000	0.0000	20.0000	641.8000 (32)
Party Ceiling 1			61.8300			30.0000	1854.9000 (32b)
Internal Wall 1			107.9200			75.0000	8093.9999 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11769.1796 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							190.3474 (35)
List of Thermal Bridges							
K1 Element					Length	Psi-value	Total
E2 Other lintels (including other steel lintels)					9.1000	0.0500	0.4550
E3 Sill					9.1000	0.0500	0.4550

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E4 Jamb						15.9000		0.0500		0.7950		
E5 Ground floor (normal)						21.3100		0.1000		2.1310		
E7 Party floor between dwellings (in blocks of flats)						21.3100		0.0700		1.4917		
E16 Corner (normal)						4.6200		0.0900		0.4158		
E18 Party wall between dwellings						4.6200		0.0600		0.2772		
Pl Party wall - Ground floor						13.8900		0.0800		1.1112		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											7.1319	(36)
Point Thermal bridges											0.0000	
Total fabric heat loss										(33) + (36) + (36a) =	37.6443	(37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	26.7668	26.6425	26.5207	25.9486	25.8415	25.3432	25.3432	25.2509	25.5351	25.8415	26.0581	26.2845 (38)
Average = Sum(39)m / 12 =	64.4111	64.2868	64.1650	63.5929	63.4858	62.9875	62.9875	62.8953	63.1795	63.4858	63.7024	63.9288 (39)
												63.5924
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0417	1.0397	1.0378	1.0285	1.0268	1.0187	1.0187	1.0172	1.0218	1.0268	1.0303	1.0339 (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												2.0329 (42)
Hot water usage for mixer showers												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths												
	25.1959	24.8218	24.2948	23.3232	22.5957	21.7890	21.3533	21.8765	22.4462	23.3094	24.3010	25.1108 (42b)
Hot water usage for other uses												
	35.4487	34.1596	32.8706	31.5815	30.2925	29.0035	29.0035	30.2925	31.5815	32.8706	34.1596	35.4487 (42c)
Average daily hot water use (litres/day)												55.5867 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	60.6446	58.9814	57.1654	54.9048	52.8882	50.7925	50.3567	52.1690	54.0278	56.1800	58.4607	60.5594 (44)
Energy conte	96.0462	83.9887	87.8611	75.1619	71.1977	62.4552	60.9021	64.5961	66.6217	76.2358	83.2879	94.8214 (45)
Energy content (annual)										Total = Sum(45)m =		923.1759
Distribution loss	(46)m = 0.15 x (45)m											
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
	81.6393	71.3904	74.6819	63.8876	60.5180	53.0870	51.7668	54.9067	56.6284	64.8004	70.7948	80.5982 (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												
	81.6393	71.3904	74.6819	63.8876	60.5180	53.0870	51.7668	54.9067	56.6284	64.8004	70.7948	80.5982 (64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				784.6995 (64)
Electric shower(s)												785 (64)
	46.6920	41.6029	45.4288	43.3521	44.1656	42.1297	43.5340	44.1656	43.3521	45.4288	44.5746	46.6920 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												531.1183 (64a)
Heat gains from water heating, kWh/month												
	32.0828	28.2483	30.0277	26.8099	26.1709	23.8042	23.8252	24.7681	24.9951	27.5573	28.8423	31.8225 (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
	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	90.0731	99.7238	90.0731	93.0756	90.0731	93.0756	90.0731	90.0731	93.0756	90.0731	93.0756	90.0731 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	177.5375	179.3798	174.7373	164.8540	152.3781	140.6525	132.8190	130.9767	135.6192	145.5026	157.9785	169.7041 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644 (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)												
	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150 (71)
Water heating gains (Table 5)												
	43.1221	42.0362	40.3598	37.2360	35.1760	33.0613	32.0231	33.2904	34.7155	37.0394	40.0588	42.7722 (72)
Total internal gains												
	364.2258	374.6330	358.6634	348.6587	331.1203	320.2825	308.4084	307.8334	316.9034	326.1082	344.6060	356.0426 (73)

6. Solar gains												

[Jan]												
			Area	Solar flux	g	Specific data	FF	Access	Gains			
			m2	Table 6a	W/m2	or Table 6b	factor	factor	W			
							Table 6c	Table 6d				
Northeast			3.5600	11.2829	0.3300	0.0000	0.7700	10.2065 (75)				
Southeast			1.3600	36.7938	0.3300	0.0000	0.7700	12.7151 (77)				
Southwest			2.0200	36.7938	0.3300	0.0000	0.7700	18.8856 (79)				
Southwest			5.5700	36.7938	0.6300	0.7000	0.7700	62.6328 (79)				

Solar gains	104.4400	181.2902	257.0541	333.5961	387.4322	390.6905	374.1454	333.0548	283.4156	202.7922	125.7124	88.9794 (83)
Total gains	468.6659	555.9231	615.7174	682.2548	718.5525	710.9730	682.5539	640.8883	600.3190	528.9004	470.3184	445.0220 (84)

7. Mean internal temperature (heating season)												

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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	50.7555	50.8536	50.9501	51.4085	51.4952	51.9026	51.9026	51.9788	51.7449	51.4952	51.3202	51.1384
alpha	4.3837	4.3902	4.3967	4.4272	4.4330	4.4602	4.4602	4.4653	4.4497	4.4330	4.4213	4.4092
util living area	0.9850	0.9687	0.9383	0.8612	0.7282	0.5465	0.4017	0.4442	0.6681	0.8937	0.9705	0.9879 (86)
MIT	19.6553	19.9121	20.2269	20.6004	20.8523	20.9680	20.9934	20.9898	20.9234	20.5878	20.0579	19.6082 (87)
Th 2	20.0487	20.0504	20.0520	20.0596	20.0611	20.0678	20.0678	20.0690	20.0652	20.0611	20.0582	20.0551 (88)
util rest of house	0.9815	0.9615	0.9243	0.8314	0.6763	0.4744	0.3187	0.3576	0.5958	0.8638	0.9624	0.9849 (89)
MIT 2	18.8345	19.0875	19.3933	19.7468	19.9624	20.0520	20.0657	20.0656	20.0230	19.7451	19.2396	18.7930 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.0879	19.3421	19.6507	20.0103	20.2372	20.3348	20.3522	20.3510	20.3010	20.0053	19.4922	19.0447 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.0879	19.3421	19.6507	20.0103	20.2372	20.3348	20.3522	20.3510	20.3010	20.0053	19.4922	19.0447 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9768	0.9549	0.9173	0.8297	0.6865	0.4956	0.3443	0.3843	0.6150	0.8618	0.9564	0.9808 (94)
Useful gains	457.7980	530.8739	564.7796	566.0793	493.3199	352.3320	234.9719	246.2706	369.1906	455.7841	449.8245	436.4973 (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	952.5079	928.4385	843.8138	706.5389	541.9907	361.2228	236.3393	248.4961	391.7731	597.1031	789.4141	949.0028 (97)
Space heating kWh	368.0641	267.1634	207.6015	101.1309	36.2110	0.0000	0.0000	0.0000	0.0000	105.1413	244.5045	381.3041 (98a)
Space heating requirement - total per year (kWh/year)	1711.1209											
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	368.0641	267.1634	207.6015	101.1309	36.2110	0.0000	0.0000	0.0000	0.0000	105.1413	244.5045	381.3041 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1711.1209											
Space heating per m2	(98c) / (4) = 27.6746 (99)											

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	592.0828	466.1077	478.0039	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9150	0.9543	0.9393	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	541.7767	444.7849	449.0076	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	797.4103	765.9767	719.0197	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	184.0562	238.9667	200.8890	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	46.0140	59.7417	50.2223	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement	155.9780 (107)											
Energy for space heating	27.6746 (99)											
Energy for space cooling	2.5227 (108)											
Total	30.1973 (109)											
Fabric Energy Efficiency (DFEE)	30.2 (109)											

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

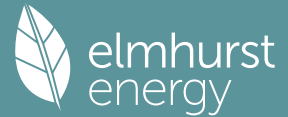
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	61.8300 (1b)	x 2.3100 (2b)	= 142.8273 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.8300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	142.8273 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	(6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(7a)+(7b)+(7c) = 20.0000 / (5) = 0.1400 (8)
Pressure test	Yes

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

Blower Door
5.0000 (17)
0.3900 (18)
2 (19)

Shelter factor
Infiltration rate adjusted to include shelter factor

$$(20) = 1 - [0.075 \times (19)] = 0.8500 (20)$$
$$(21) = (18) \times (20) = 0.3315 (21)$$

	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	0.4227	0.4144	0.4061	0.3647	0.3564	0.3149	0.3149	0.3067	0.3315	0.3564	0.3730	0.3895	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													(23c)
Effective ac	0.5893	0.5859	0.5825	0.5665	0.5635	0.5496	0.5496	0.5470	0.5550	0.5635	0.5696	0.5759	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1600	1.0000	2.1600			(26)
TER Opening Type			12.5100	1.1450	14.3244			(27)
GF			61.8300	0.1300	8.0379			(28a)
Main	49.2261	14.6700	34.5561	0.1800	6.2201			(29a)
Total net area of external elements Aum(A, m2)			111.0561					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	30.7424		(33)
Main dwelling								
Party Wall 1			32.0900	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							190.3474	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	9.1000	0.0500	0.4550	
E3 Sill	9.1000	0.0500	0.4550	
E4 Jamb	15.9000	0.0500	0.7950	
E5 Ground floor (normal)	21.3100	0.1600	3.4096	
E7 Party floor between dwellings (in blocks of flats)	21.3100	0.0700	1.4917	
E16 Corner (normal)	4.6200	0.0900	0.4158	
E18 Party wall between dwellings	4.6200	0.0600	0.2772	
P1 Party wall - Ground floor	13.8900	0.0800	1.1112	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				8.4105 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	39.1529 (37)

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

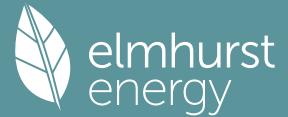
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.7771	27.6136	27.4534	26.7006	26.5598	25.9041	25.9041	25.7827	26.1567	26.5598	26.8447	27.1426	(38)
Heat transfer coeff	66.9301	66.7666	66.6063	65.8535	65.7127	65.0571	65.0571	64.9356	65.3096	65.7127	65.9976	66.2955	(39)
Average = Sum(39)m / 12 =													65.8529
HLP	1.0825	1.0798	1.0772	1.0651	1.0628	1.0522	1.0522	1.0502	1.0563	1.0628	1.0674	1.0722	(40)
HLP (average)												1.0651	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.0329 (42)
Hot water usage for mixer showers													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
25.1959	24.8218	24.2948	23.3232	22.5957	21.7890	21.3533	21.8765	22.4462	23.3094	24.3010	25.1108		(42b)
Hot water usage for other uses													
35.4487	34.1596	32.8706	31.5815	30.2925	29.0035	29.0035	30.2925	31.5815	32.8706	34.1596	35.4487		(42c)
Average daily hot water use (litres/day)													55.5867 (43)
Daily hot water use													
60.6446	58.9814	57.1654	54.9048	52.8882	50.7925	50.3567	52.1690	54.0278	56.1800	58.4607	60.5594		(44)
Energy conte	96.0462	83.9887	87.8611	75.1619	71.1977	62.4552	60.9021	64.5961	66.6217	76.2358	83.2879	94.8214	(45)
Energy content (annual)										Total = Sum(45)m =		923.1759	
Distribution loss (46)m = 0.15 x (45)m													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
81.6393	71.3904	74.6819	63.8876	60.5180	53.0870	51.7668	54.9067	56.6284	64.8004	70.7948	80.5982		(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	81.6393	71.3904	74.6819	63.8876	60.5180	53.0870	51.7668	54.9067	56.6284	64.8004	70.7948	80.5982	(64)
Total per year (kWh/year) = Sum(64)m =													784.6995 (64)
Electric shower(s)	46.6920	41.6029	45.4288	43.3521	44.1656	42.1297	43.5340	44.1656	43.3521	45.4288	44.5746	46.6920	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													531.1183 (64a)
Heat gains from water heating, kWh/month	32.0828	28.2483	30.0277	26.8099	26.1709	23.8042	23.8252	24.7681	24.9951	27.5573	28.8423	31.8225	(65)

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

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Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	90.0731	99.7238	90.0731	93.0756	90.0731	93.0756	90.0731	90.0731	93.0756	90.0731	93.0756	90.0731	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	177.5375	179.3798	174.7373	164.8540	152.3781	140.6525	132.8190	130.9767	135.6192	145.5026	157.9785	169.7041	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	(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)	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	(71)
Water heating gains (Table 5)	43.1221	42.0362	40.3598	37.2360	35.1760	33.0613	32.0231	33.2904	34.7155	37.0394	40.0588	42.7722	(72)
Total internal gains	364.2258	374.6330	358.6634	348.6587	331.1203	320.2825	308.4084	307.8334	316.9034	326.1082	344.6060	356.0426	(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				3.5600	11.2829	0.6300	0.7000	0.7700	12.2756 (75)			
Southeast				1.3600	36.7938	0.6300	0.7000	0.7700	15.2928 (77)			
Southwest				7.5900	36.7938	0.6300	0.7000	0.7700	85.3471 (79)			
Solar gains	112.9155	196.4143	279.5731	364.5582	424.9053	429.1211	410.6854	364.5494	308.8289	219.9998	135.9893	96.1516 (83)
Total gains	477.1413	571.0472	638.2364	713.2169	756.0256	749.4036	719.0938	672.3829	625.7323	546.1080	480.5952	452.1942 (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	48.8453	48.9649	49.0827	49.6438	49.7502	50.2515	50.2515	50.3455	50.0572	49.7502	49.5354	49.3128	
alpha	4.2564	4.2643	4.2722	4.3096	4.3167	4.3501	4.3501	4.3564	4.3371	4.3167	4.3024	4.2875	
util living area	0.9845	0.9672	0.9349	0.8537	0.7171	0.5356	0.3937	0.4370	0.6615	0.8905	0.9695	0.9874	(86)
MIT	19.5941	19.8654	20.1982	20.5906	20.8496	20.9672	20.9931	20.9893	20.9198	20.5704	20.0172	19.5489	(87)
Th 2	20.0152	20.0173	20.0195	20.0295	20.0313	20.0401	20.0401	20.0417	20.0367	20.0313	20.0275	20.0236	(88)
util rest of house	0.9808	0.9597	0.9201	0.8225	0.6637	0.4626	0.3099	0.3493	0.5876	0.8594	0.9612	0.9844	(89)
MIT 2	18.7484	19.0159	19.3390	19.7109	19.9317	20.0242	20.0380	20.0381	19.9929	19.7035	19.1757	18.7102	(90)
Living area fraction	19.0095	19.2782	19.6042	19.9825	20.2151	20.3153	20.3329	20.3318	20.2791	19.9711	19.4355	18.9692	(91)
MIT	19.0095	19.2782	19.6042	19.9825	20.2151	20.3153	20.3329	20.3318	20.2791	19.9711	19.4355	18.9692	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0095	19.2782	19.6042	19.9825	20.2151	20.3153	20.3329	20.3318	20.2791	19.9711	19.4355	18.9692	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9758	0.9527	0.9127	0.8209	0.6744	0.4840	0.3357	0.3762	0.6071	0.8572	0.9548	0.9801	(94)
Useful gains	465.6182	544.0421	582.4975	585.4658	509.8483	362.7264	241.4141	252.9696	379.8954	468.1324	458.8796	443.1768	(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	984.5094	959.9814	872.8247	729.8205	559.5500	371.8232	242.8490	255.3142	403.5541	615.8030	814.1153	979.1295	(97)
Space heating kWh	386.0551	279.5112	216.0035	103.9354	36.9780	0.0000	0.0000	0.0000	0.0000	109.8669	255.7697	398.7488	(98a)
Space heating requirement - total per year (kWh/year)												1786.8687	
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	386.0551	279.5112	216.0035	103.9354	36.9780	0.0000	0.0000	0.0000	0.0000	109.8669	255.7697	398.7488	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1786.8687	
Space heating per m2												28.8997	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	611.5363	481.4222	493.5109	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9170	0.9548	0.9397	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	560.7684	459.6587	463.7314	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	842.3291	808.6857	755.8316	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	202.7237	259.6761	217.3225	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction													
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	50.6809	64.9190	54.3306	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling requirement												169.9306	(107)
Energy for space heating												28.8997	(99)
Energy for space cooling												2.7484	(108)
Total												31.6481	(109)
Fabric Energy Efficiency (TFEE)												31.6	(109)

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Property Reference	APT-00				Issued on Date	07/05/2025
Assessment Reference	001		Prop Type Ref			
Property	Highmoor Lane, CLECKHEATON, BD19 6LW					
SAP Rating	93 A	DER	10.94	TER	11.97	
Environmental	92 A	% DER < TER				8.60
CO ₂ Emissions (t/year)	0.66	DFEE	30.20	TFEE	31.65	
Compliance Check	See BREL	% DFEE < TFEE				4.58
% DPER < TPER	7.83	DPER	57.67	TPER	62.57	
Assessor Details	Mr. Paul Goddard				Assessor ID	B342-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	61.8300 (1b)	2.3100 (2b)	142.8273 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.8300		142.8273 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	142.8273 (5)

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000	(17)
Infiltration rate	0.2000	(18)
Number of sides sheltered	2	(19)

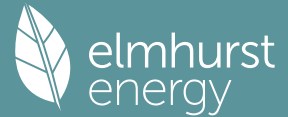
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1700 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			2.1600	1.0000	2.1600		(26)
Window			6.9400	1.1450	7.9466		(27)
Patio Door			5.5700	1.3258	7.3845		(27)
GF			61.8300	0.1100	6.8013	9.0000	556.4700 (28a)
Main	49.2261	14.6700	34.5561	0.1800	6.2201	18.0000	622.0098 (29a)
Total net area of external elements Aum(A, m ²)			111.0561				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	30.5124	(33)
Main dwelling							
Party Wall 1			32.0900	0.0000	0.0000	20.0000	641.8000 (32)
Party Ceiling 1			61.8300			20.0000	1236.6000 (32b)
Internal Wall 1			107.9200			75.0000	8093.9999 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 11150.8796 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							180.3474 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	

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E2 Other lintels (including other steel lintels)						9.1000		0.0500		0.4550		
E3 Sill						9.1000		0.0500		0.4550		
E4 Jamb						15.9000		0.0500		0.7950		
E5 Ground floor (normal)						21.3100		0.1000		2.1310		
E7 Party floor between dwellings (in blocks of flats)						21.3100		0.0700		1.4917		
E16 Corner (normal)						4.6200		0.0900		0.4158		
E18 Party wall between dwellings						4.6200		0.0600		0.2772		
P1 Party wall - Ground floor						13.8900		0.0800		1.1112		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											7.1319	(36)
Point Thermal bridges											0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	37.6443 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	23.5665	23.5665	23.5665	23.5665	23.5665	23.5665	23.5665	23.5665	23.5665	23.5665	23.5665	23.5665 (38)
Average = Sum(39)m / 12 =	61.2108	61.2108	61.2108	61.2108	61.2108	61.2108	61.2108	61.2108	61.2108	61.2108	61.2108	61.2108 (39)
HLP	0.9900	0.9900	0.9900	0.9900	0.9900	0.9900	0.9900	0.9900	0.9900	0.9900	0.9900	0.9900 (40)
HLP (average)												0.9900
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.0329 (42)
Hot water usage for mixer showers												
Hot water usage for baths	58.3042	57.4280	56.1512	53.7083	51.9055	49.8950	48.7523	50.0194	51.4084	53.5670	56.0624	58.0808 (42a)
Hot water usage for other uses	25.1959	24.8218	24.2948	23.3232	22.5957	21.7890	21.3533	21.8765	22.4462	23.3094	24.3010	25.1108 (42b)
Average daily hot water use (litres/day)	35.4487	34.1596	32.8706	31.5815	30.2925	29.0035	29.0035	30.2925	31.5815	32.8706	34.1596	35.4487 (42c)
												109.3412 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	118.9488	116.4094	113.3166	108.6131	104.7937	100.6875	99.1090	102.1884	105.4362	109.7471	114.5231	118.6403 (44)
Energy content (annual)	188.3859	165.7654	174.1634	148.6858	141.0724	123.8070	119.8637	126.5306	130.0134	148.9257	163.1592	185.7620 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	28.2579	24.8648	26.1245	22.3029	21.1609	18.5710	17.9796	18.9796	19.5020	22.3389	24.4739	27.8643 (46)
Total storage loss												
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	1.7779	1.6107	1.7516	1.5723	1.5510	1.4171	1.3662	1.4274	1.4203	1.5562	1.6193	1.7595 (59)
Total heat required for water heating calculated for each month												
WWHRS	190.1638	167.3762	175.9150	150.2581	142.6235	125.2241	121.2299	127.9580	131.4336	150.4820	164.7784	187.5214 (62)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
Solar input	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
12Total per year (kWh/year)												
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 =												1835 (64)
Heat gains from water heating, kWh/month	63.0828	55.5197	58.3472	49.8311	47.2944	41.5201	40.1962	42.4283	43.5845	49.9069	54.6552	62.2057 (65)

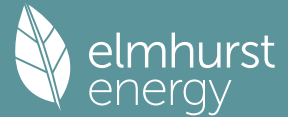
5. Internal gains (see Table 5 and 5a)												

Metabolic gains (Table 5), Watts												
(66)m	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	90.0731	99.7238	90.0731	93.0756	90.0731	93.0756	90.0731	90.0731	93.0756	90.0731	93.0756	90.0731 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	177.5375	179.3798	174.7373	164.8540	152.3781	140.6525	132.8190	130.9767	135.6192	145.5026	157.9785	169.7041 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644 (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)	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150 (71)
Water heating gains (Table 5)	84.7887	82.6186	78.4237	69.2099	63.5677	57.6668	54.0272	57.0273	60.5340	67.0791	75.9101	83.6098 (72)
Total internal gains	408.8925	418.2153	399.7273	383.6326	362.5120	344.8880	330.4125	331.5703	342.7220	359.1480	383.4572	399.8802 (73)

6. Solar gains												

[Jan]												
	Area											
	m2											
	Solar flux											
	Table 6a											
	W/m2											
	Specific data											
	or Table 6b											
	g											
	Specific data											
	or Table 6c											
	FF											
	Access											
	factor											
	Table 6d											
	Gains											
	W											
Northeast	3.5600											10.2065 (75)
Southeast	1.3600											12.7151 (77)
Southwest	2.0200											18.8856 (79)
Southwest	5.5700											62.6328 (79)
Solar gains	104.4400	181.2902	257.0541	333.5961	387.4322	390.6905	374.1454	333.0548	283.4156	202.7922	125.7124	88.9794 (83)
Total gains	513.3325	599.5055	656.7813	717.2287	749.9442	735.5785	704.5579	664.6251	626.1376	561.9402	509.1697	488.8596 (84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	50.6032	50.6032	50.6032	50.6032	50.6032	50.6032	50.6032	50.6032	50.6032	50.6032	50.6032	50.6032	21.0000 (85)
alpha	4.3735	4.3735	4.3735	4.3735	4.3735	4.3735	4.3735	4.3735	4.3735	4.3735	4.3735	4.3735	
util living area	0.9749	0.9521	0.9131	0.8267	0.6882	0.5162	0.3787	0.4179	0.6299	0.8609	0.9546	0.9793	(86)
MIT	19.7948	20.0422	20.3351	20.6589	20.8772	20.9722	20.9942	20.9912	20.9355	20.6470	20.1575	19.7306	(87)
Th 2	20.0917	20.0917	20.0917	20.0917	20.0917	20.0917	20.0917	20.0917	20.0917	20.0917	20.0917	20.0917	(88)
util rest of house	0.9695	0.9425	0.8959	0.7948	0.6375	0.4488	0.3022	0.3380	0.5610	0.8272	0.9437	0.9748	(89)
MIT 2	18.7018	19.0102	19.3699	19.7508	19.9862	20.0738	20.0893	20.0877	20.0457	19.7474	19.1588	18.6210	(90)
Living area fraction									fLA = Living area / (4) =			0.3087	(91)
MIT	19.0393	19.3288	19.6679	20.0311	20.2613	20.3512	20.3687	20.3667	20.3204	20.0252	19.4672	18.9636	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.8893	19.1788	19.5179	19.8811	20.1113	20.2012	20.2187	20.2167	20.1704	19.8752	19.3172	18.8136	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9602	0.9304	0.8832	0.7866	0.6386	0.4571	0.3130	0.3491	0.5672	0.8181	0.9320	0.9664	(94)
Useful gains	492.9135	557.8005	580.0612	564.1542	478.9499	336.2475	220.5383	232.0501	355.1629	459.6996	474.5287	472.4402	(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	893.0229	874.0189	796.8359	672.1642	514.8639	342.8528	221.5032	233.6209	371.5747	567.7404	747.8229	894.5111	(97)
Space heating kWh	297.6814	212.4988	161.2804	77.7672	26.7200	0.0000	0.0000	0.0000	0.0000	80.3824	196.7719	314.0208	(98a)
Space heating requirement - total per year (kWh/year)												1367.1228	
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	297.6814	212.4988	161.2804	77.7672	26.7200	0.0000	0.0000	0.0000	0.0000	80.3824	196.7719	314.0208	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1367.1228	
Space heating per m2										(98c) / (4) =		22.1110	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													88.7000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	297.6814	212.4988	161.2804	77.7672	26.7200	0.0000	0.0000	0.0000	0.0000	80.3824	196.7719	314.0208	(98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000	(210)
Space heating fuel (main heating system)	335.6047	239.5702	181.8268	87.6744	30.1240	0.0000	0.0000	0.0000	0.0000	90.6227	221.8397	354.0257	(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	190.1638	167.3762	175.9150	150.2581	142.6235	125.2241	121.2299	127.9580	131.4336	150.4820	164.7784	187.5214	(64)
Efficiency of water heater (217)m	83.3690	82.7211	81.7074	80.0472	77.9329	76.2000	76.2000	76.2000	76.2000	80.1318	82.5298	76.2000	(216)
Fuel for water heating, kWh/month	228.0988	202.3380	215.2987	187.7119	183.0081	164.3361	159.0943	167.9239	172.4851	187.7930	199.6593	224.3774	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	9.7777	8.8315	9.7777	9.4623	9.7777	9.4623	9.7777	9.7777	9.4623	9.7777	9.4623	9.7777	(231)
Lighting	21.0653	16.8993	15.2160	11.1479	8.6109	7.0352	7.8552	10.2105	13.2624	17.4010	19.6544	21.6507	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-24.0719	-35.5797	-53.7175	-62.8994	-69.4846	-65.4486	-64.6025	-60.1394	-52.2505	-41.8083	-26.9679	-20.5640	(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	-11.1932	-24.8755	-52.8193	-83.9346	-114.5984	-116.4248	-114.5065	-94.7226	-66.3264	-36.5152	-15.1953	-8.7126	(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												1541.2884	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												76.2000	
Water heating fuel used												2292.1246	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.5100, total flow = 21.0000, SFP = 0.1671)													
mechanical ventilation fans (SFP = 0.1671)												29.1245	(230a)
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												115.1245	(231)
Electricity for lighting (calculated in Appendix L)												170.0087	(232)

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

PV generation	-1317.3590 (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	2801.1873 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1541.2884	0.2100	323.6706 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2292.1246	0.2100	481.3462 (264)
Space and water heating			805.0167 (265)
Pumps, fans and electric keep-hot	115.1245	0.1387	15.9692 (267)
Energy for lighting	170.0087	0.1443	24.5375 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-577.5344	0.1338	-77.2467
PV Unit electricity exported	-739.8246	0.1245	-92.0930
Total			-169.3398 (269)
Total CO2, kg/year			676.1837 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.9400 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1541.2884	1.1300	1741.6559 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2292.1246	1.1300	2590.1008 (278)
Space and water heating			4331.7568 (279)
Pumps, fans and electric keep-hot	115.1245	1.5128	174.1604 (281)
Energy for lighting	170.0087	1.5338	260.7650 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-577.5344	1.4943	-862.9997
PV Unit electricity exported	-739.8246	0.4569	-337.9989
Total			-1200.9986 (283)
Total Primary energy kWh/year			3565.6835 (286)
Dwelling Primary energy Rate (DPER)			57.6700 (287)

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

CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

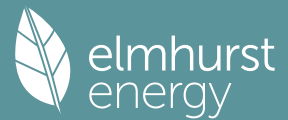
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	61.8300 (1b)	x 2.3100 (2b)	= 142.8273 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.8300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	142.8273 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1400 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3900 (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) = 0.3315 (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	0.4227	0.4144	0.4061	0.3647	0.3564	0.3149	0.3149	0.3067	0.3315	0.3564	0.3730	0.3895 (22b)
Effective ac	0.5893	0.5859	0.5825	0.5665	0.5635	0.5496	0.5496	0.5470	0.5550	0.5635	0.5696	0.5759 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.1600	1.0000	2.1600		(26)
TER Opening Type			12.5100	1.1450	14.3244		(27)
GF			61.8300	0.1300	8.0379		(28a)
Main	49.2261	14.6700	34.5561	0.1800	6.2201		(29a)
Total net area of external elements Aum(A, m2)			111.0561				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	30.7424	(33)
Main dwelling							
Party Wall 1			32.0900	0.0000	0.0000		(32)

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

190.3474 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.1000	0.0500	0.4550
E3 Sill	9.1000	0.0500	0.4550
E4 Jamb	15.9000	0.0500	0.7950
E5 Ground floor (normal)	21.3100	0.1600	3.4096
E7 Party floor between dwellings (in blocks of flats)	21.3100	0.0700	1.4917
E16 Corner (normal)	4.6200	0.0900	0.4158
E18 Party wall between dwellings	4.6200	0.0600	0.2772
P1 Party wall - Ground floor	13.8900	0.0800	1.1112

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

8.4105 (36)

Point Thermal Bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 39.1529 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	27.7771	27.6136	27.4534	26.7006	26.5598	25.9041	25.9041	25.7827	26.1567	26.5598	26.8447	27.1426
Heat transfer coeff	66.9301	66.7666	66.6063	65.8535	65.7127	65.0571	65.0571	64.9356	65.3096	65.7127	65.9976	66.2955
Average = Sum(39)m / 12 =												65.8529

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0825	1.0798	1.0772	1.0651	1.0628	1.0522	1.0522	1.0502	1.0563	1.0628	1.0674	1.0722
HLP (average)												1.0651
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

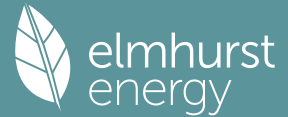
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0329 (42)
Hot water usage for mixer showers												
58.3042	57.4280	56.1512	53.7083	51.9055	49.8950	48.7523	50.0194	51.4084	53.5670	56.0624	58.0808	(42a)
Hot water usage for baths												
25.1959	24.8218	24.2948	23.3232	22.5957	21.7890	21.3533	21.8765	22.4462	23.3094	24.3010	25.1108	(42b)
Hot water usage for other uses												
35.4487	34.1596	32.8706	31.5815	30.2925	29.0035	29.0035	30.2925	31.5815	32.8706	34.1596	35.4487	(42c)
Average daily hot water use (litres/day)												109.3412 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	118.9488	116.4094	113.3166	108.6131	104.7937	100.6875	99.1090	102.1884	105.4362	109.7471	114.5231	118.6403 (44)
Energy conte	188.3859	165.7654	174.1634	148.6858	141.0724	123.8070	119.8637	126.5306	130.0134	148.9257	163.1592	185.7620 (45)
Energy content (annual)										Total = Sum(45)m =		1816.1345
Distribution loss (46)m = 0.15 x (45)m												
28.2579	24.8648	26.1245	22.3029	21.1609	18.5710	17.9796	18.9796	19.5020	22.3389	24.4739	27.8643	(46)
Water storage loss:												
Total storage loss												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.5048	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
239.3448	211.7928	225.1223	198.0009	192.0314	173.1221	170.3686	177.4895	179.3284	199.8846	212.4742	236.7209	(62)
WWHRS	-26.6543	-23.5732	-24.6845	-20.4398	-19.0491	-16.3005	-15.2791	-16.2478	-16.8651	-19.8821	-22.5240	-26.1607 (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	212.6905	188.2196	200.4378	177.5611	172.9822	156.8216	155.0895	161.2417	162.4633	180.0026	189.9502	210.5602 (64)
12Total per year (kWh/year)												2168.0203 (64)
Electric shower(s)												2168 (64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											0.0000 (64a)
Heat gains from water heating, kWh/month												
75.3780	66.6239	70.6491	61.7668	59.6463	53.4946	52.4809	54.8111	55.5582	62.2575	66.5792	74.5056	(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	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	90.0731	99.7238	90.0731	93.0756	90.0731	93.0756	90.0731	90.0731	93.0756	90.0731	93.0756	90.0731 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	177.5375	179.3798	174.7373	164.8540	152.3781	140.6525	132.8190	130.9767	135.6192	145.5026	157.9785	169.7041 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644 (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)	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150 (71)
Water heating gains (Table 5)	101.3146	99.1426	94.9584	85.7872	80.1698	74.2980	70.5388	73.6709	77.1642	83.6795	92.4711	100.1419 (72)
Total internal gains	425.4183	434.7394	416.2620	400.2099	379.1141	361.5192	346.9241	348.2139	359.3521	375.7483	400.0183	416.4123 (73)

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6. Solar gains

[Jan]	Area m ²		Solar flux Table 6a W/m ²		Specific data or Table 6b		Specific data or Table 6c		FF		Access factor Table 6d		Gains W	
Northeast	3.5600		11.2829		0.6300		0.7000		0.7700				12.2756	(75)
Southeast	1.3600		36.7938		0.6300		0.7000		0.7700				15.2928	(77)
Southwest	7.5900		36.7938		0.6300		0.7000		0.7700				85.3471	(79)
Solar gains	112.9155	196.4143	279.5731	364.5582	424.9053	429.1211	410.6854	364.5494	308.8289	219.9998	135.9893		96.1516	(83)
Total gains	538.3338	631.1537	695.8351	764.7681	804.0194	790.6402	757.6095	712.7633	668.1810	595.7481	536.0075		512.5639	(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	48.8453	48.9649	49.0827	49.6438	49.7502	50.2515	50.2515	50.3455	50.0572	49.7502	49.5354	49.3128		
alpha	4.2564	4.2643	4.2722	4.3096	4.3167	4.3501	4.3501	4.3564	4.3371	4.3167	4.3024	4.2875		
util living area	0.9764	0.9546	0.9162	0.8279	0.6874	0.5108	0.3744	0.4135	0.6291	0.8631	0.9563	0.9803	(86)	
MIT	19.7153	19.9744	20.2870	20.6435	20.8726	20.9727	20.9943	20.9913	20.9339	20.6312	20.1187	19.6706	(87)	
Th 2	20.0152	20.0173	20.0195	20.0295	20.0313	20.0401	20.0401	20.0417	20.0367	20.0313	20.0275	20.0236	(88)	
util rest of house														
	0.9709	0.9447	0.8984	0.7940	0.6334	0.4400	0.2944	0.3300	0.5560	0.8276	0.9450	0.9757	(89)	
MIT 2	18.5420	18.8666	19.2519	19.6781	19.9245	20.0232	20.0379	20.0381	19.9912	19.6769	19.0591	18.4918	(90)	
Living area fraction														
	18.9042	19.2086	19.5714	19.9762	20.2172	20.3164	20.3332	20.3324	20.2823	19.9716	19.3862	18.8557	(92)	
Temperature adjustment												0.0000		
adjusted MIT	18.9042	19.2086	19.5714	19.9762	20.2172	20.3164	20.3332	20.3324	20.2823	19.9716	19.3862	18.8557	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	0.9629	0.9347	0.8888	0.7920	0.6443	0.4608	0.3190	0.3556	0.5754	0.8251	0.9357	0.9685	(94)	
Useful gains	518.3697	589.9368	618.4714	605.6684	518.0051	364.3529	241.6965	253.4714	384.4739	491.5635	501.5611	496.4091	(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	977.4629	955.3385	870.6408	729.4069	559.6891	371.8899	242.8693	255.3515	403.7608	615.8303	810.8622	971.6083	(97)	
Space heating kWh	341.5654	245.5500	187.6140	89.0917	31.0129	0.0000	0.0000	0.0000	0.0000	92.4545	222.6968	353.5482	(98a)	
Space heating requirement - total per year (kWh/year)												1563.5335		
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	341.5654	245.5500	187.6140	89.0917	31.0129	0.0000	0.0000	0.0000	0.0000	92.4545	222.6968	353.5482	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1563.5335		
Space heating per m ²										(98c) / (4) =		25.2876	(99)	

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													92.4000	(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	341.5654	245.5500	187.6140	89.0917	31.0129	0.0000	0.0000	0.0000	0.0000	92.4545	222.6968	353.5482	(98)	
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)	
Space heating fuel (main heating system)	369.5595	265.7467	203.0454	96.4196	33.5638	0.0000	0.0000	0.0000	0.0000	100.0590	241.0138	382.6280	(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	212.6905	188.2196	200.4378	177.5611	172.9822	156.8216	155.0895	161.2417	162.4633	180.0026	189.9502	210.5602	(64)	
Efficiency of water heater (217)m	85.3906	84.9521	84.2399	82.9821	81.4986	80.3000	80.3000	80.3000	80.3000	83.0254	84.7232	80.3000	(216)	
Fuel for water heating, kWh/month	249.0795	221.5596	237.9367	213.9753	212.2518	195.2946	193.1376	200.7991	202.3205	216.8041	224.2010	246.3189	(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	18.7154	15.0142	13.5186	9.9043	7.6504	6.2504	6.9789	9.0715	11.7830	15.4599	17.4619	19.2356	(232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-29.2039	-41.3195	-59.6204	-67.3259	-72.8775	-68.1578	-67.3418	-63.4468	-56.5991	-47.4015	-32.1683	-25.2334	(233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)	
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-16.0617	-33.8363	-67.3286	-101.2236	-133.9236	-134.5622	-132.9531	-112.5146	-82.4128	-48.3940	-21.4494	-12.6956	(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)														

Full SAP Calculation Printout



(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												1692.1358	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2613.6787	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												151.0442	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1528.0514	(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												3014.8073	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1692.1358	0.2100	355.3485	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2613.6787	0.2100	548.8725	(264)
Space and water heating			904.2211	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	151.0442	0.1443	21.8003	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-630.6959	0.1345	-84.8228	
PV Unit electricity exported	-897.3555	0.1259	-112.9517	
Total			-197.7745	(269)
Total CO2, kg/year			740.1761	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.9700	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1692.1358	1.1300	1912.1135	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2613.6787	1.1300	2953.4569	(278)
Space and water heating			4865.5704	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	151.0442	1.5338	231.6766	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-630.6959	1.4970	-944.1831	
PV Unit electricity exported	-897.3555	0.4620	-414.6101	
Total			-1358.7931	(283)
Total Primary energy kWh/year			3868.5547	(286)
Target Primary Energy Rate (TPER)			62.5700	(287)

Predicted Energy Assessment



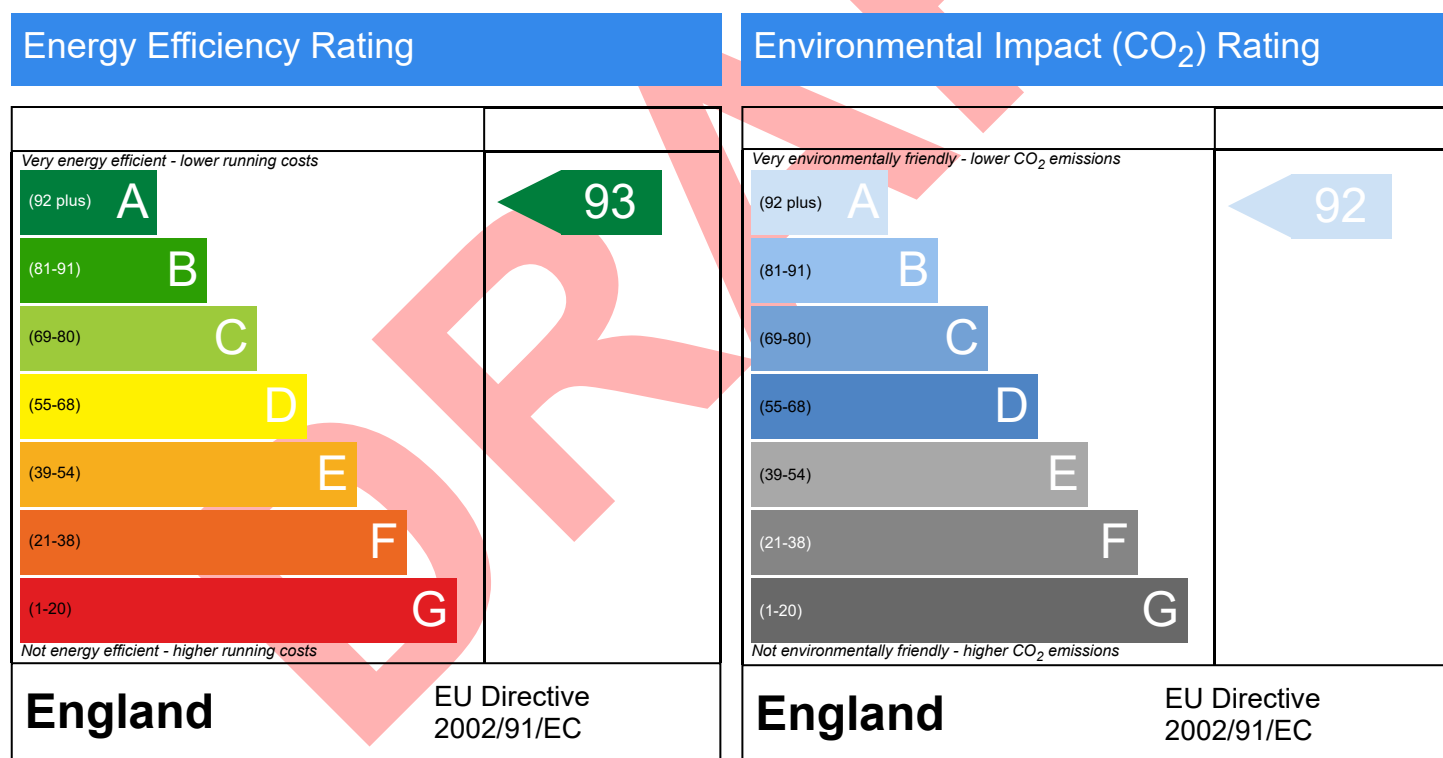
Highmoor Lane, CLECKHEATON, BD19 6LW

Dwelling type:
Date of assessment:
Produced by:
Total floor area:
DRRN:

Flat, Semi-Detached
07/05/2025
Paul Goddard
61.83 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

Energy Report



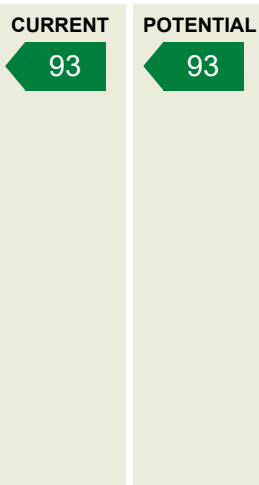
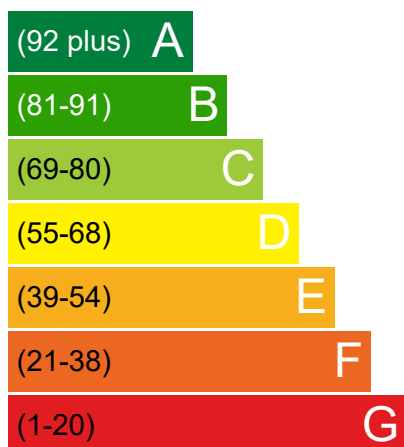
Dwelling Address	Highmoor Lane, CLECKHEATON, BD19 6LW
Reference	APT-00-001
Assessment Date	07/05/2025
Submission Date	
Property Type	Flat, Semi-Detached
Total Floor Area	62

This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

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

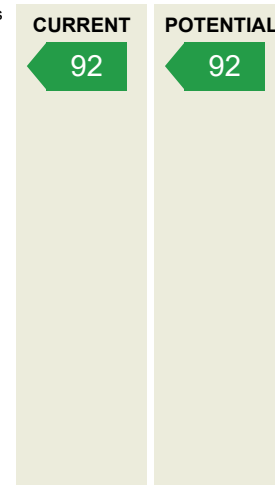
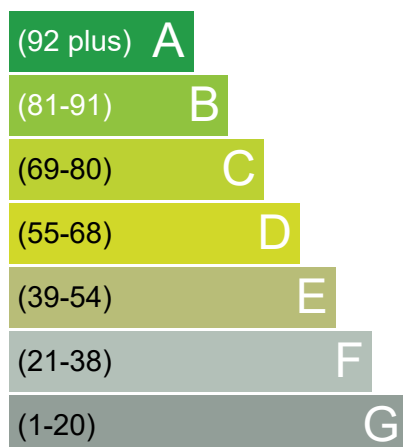
Energy Efficiency Rating

Most energy efficient - lower running costs

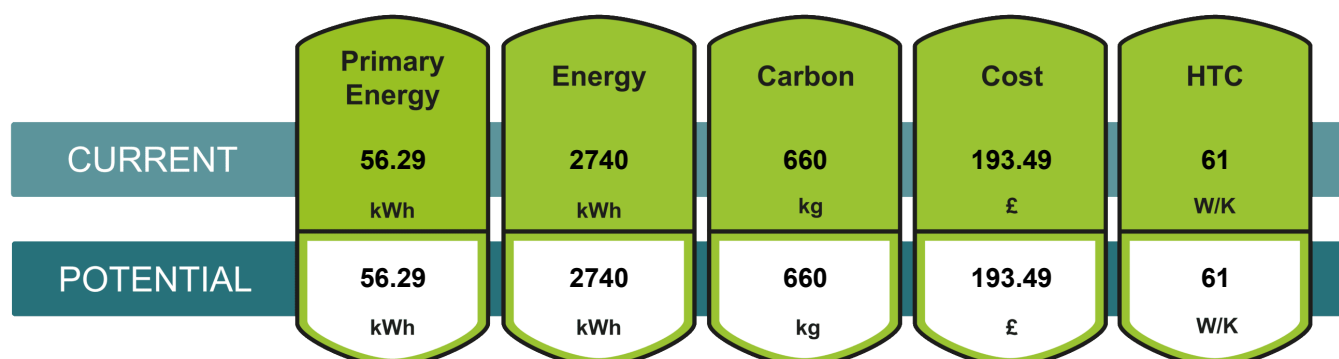


Carbon Dioxide (CO2) Emissions Rating

Very environmentally friendly - lower CO2 emissions



Additional ratings for your home



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 0.18 W/m ² K	Very Good
Floor	Average thermal transmittance 0.11 W/m ² K	Very Good
Windows	High performance glazing	Good
Main heating	Boiler and radiators, mains gas	Very Good
Main heating controls	Time and temperature zone control	Very Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 4.0 m ³ /h.m ² (assumed)	Good

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 measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating
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The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

Energy Report

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

		Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting		£44	£44	
Heating		£209	£209	
Hot Water		£129	£129	
New Technologies e.g. Impact of PV		-(£189)	-(£189)	
TOTAL		£193	£193	

Estimated energy use and potential savings



Space Heating

1434

kWh per year



Water Heating

2296

kWh per year

About this document

Created by:

Company/Trading name:

Phone number:

Email address:

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g. heating system) is working correctly.

This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.

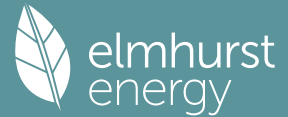
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.

The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Full SAP Calculation Printout



Property Reference	APT-01			Issued on Date	07/05/2025
Assessment Reference	001	Prop Type Ref			
Property	Highmoor Lane, CLECKHEATON, BD19 6LW				
SAP Rating	92 A	DER	11.12	TER	11.50
Environmental	91 B	% DER < TER			3.30
CO ₂ Emissions (t/year)	0.8	DFEE	32.46	TFEE	33.33
Compliance Check	See BREL	% DFEE < TFEE			2.59
% DPER < TPER	1.94	DPER	58.87	TPER	60.03
Assessor Details	Mr. Paul Goddard			Assessor ID	B342-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	4.6900 (1b)	x 2.7200 (2b)	= 12.7568 (1b) - (3b)
First floor	68.6100 (1c)	x 2.3100 (2c)	= 158.4891 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	171.2459 (5)

2. Ventilation rate

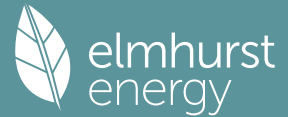
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.2000 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1700 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			2.1600	1.0000	2.1600		(26)
Window			7.0300	1.1450	8.0496		(27)
Patio Door			5.5700	1.3258	7.3845		(27)
GF			4.6900	0.1100	0.5159	9.0000	42.2100 (28a)
Main	79.1892	14.7600	64.4292	0.1800	11.5973	18.0000	1159.7255 (29a)
PIJ	68.6100		68.6100	0.0900	6.1749	9.0000	617.4900 (30)
Total net area of external elements Aum(A, m ²)			152.4892				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.8821		(33)
Main dwelling							
Party Wall 1			32.7900	0.0000	0.0000	20.0000	655.8000 (32)
Party Floor 1			63.9200			30.0000	1917.6000 (32d)
Internal Wall 1			107.9200			75.0000	8093.9999 (32c)
Internal Floor 1			4.6900			18.0000	84.4200 (32d)
Internal Ceiling 1			4.6900			9.0000	42.2100 (32e)

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Solar gains	104.6980	181.8154	258.0004	335.1502	389.5212	392.9176	376.2288	334.7157	284.5687	203.4341	126.0371	89.1901 (83)
Total gains	568.5915	656.8828	711.7739	771.0903	801.4114	785.4343	752.2298	711.8285	674.3802	611.1902	561.2949	542.7679 (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	48.1395	48.1395	48.1395	48.1395	48.1395	48.1395	48.1395	48.1395	48.1395	48.1395	48.1395	48.1395
alpha	4.2093	4.2093	4.2093	4.2093	4.2093	4.2093	4.2093	4.2093	4.2093	4.2093	4.2093	4.2093
util living area	0.9778	0.9596	0.9288	0.8576	0.7344	0.5644	0.4189	0.4597	0.6746	0.8835	0.9609	0.9815 (86)
MIT	19.6697	19.9077	20.2047	20.5575	20.8219	20.9546	20.9897	20.9848	20.9047	20.5624	20.0472	19.6081 (87)
Th 2	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892 (88)
util rest of house	0.9732	0.9514	0.9144	0.8294	0.6857	0.4937	0.3353	0.3733	0.6058	0.8540	0.9515	0.9776 (89)
MIT 2	18.5469	18.8454	19.2137	19.6367	19.9311	20.0588	20.0847	20.0820	20.0183	19.6525	19.0246	18.4692 (90)
Living area fraction									fLA =	Living area / (4) =		0.2604 (91)
MIT	18.8393	19.1220	19.4718	19.8765	20.1631	20.2921	20.3204	20.3171	20.2492	19.8895	19.2909	18.7658 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.6893	18.9720	19.3218	19.7265	20.0131	20.1421	20.1704	20.1671	20.0992	19.7395	19.1409	18.6158 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9635	0.9386	0.8997	0.8167	0.6813	0.4980	0.3429	0.3809	0.6066	0.8406	0.9389	0.9689 (94)
Useful gains	547.8611	616.5742	640.3486	629.7421	545.9735	391.1173	257.9165	271.1227	409.0761	513.7778	526.9940	525.8791 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	14.0000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1047.3000	1024.2056	933.2120	787.9876	605.0504	403.3703	259.8635	274.1829	436.6386	665.1979	876.3745	1049.2283 (97)
Space heating kWh	371.5825	273.9283	217.8904	113.9368	43.9532	0.0000	0.0000	0.0000	0.0000	112.6565	251.5540	389.3718 (98a)
Space heating requirement - total per year (kWh/year)												1774.8735
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	371.5825	273.9283	217.8904	113.9368	43.9532	0.0000	0.0000	0.0000	0.0000	112.6565	251.5540	389.3718 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1774.8735
Space heating per m2										(98c) / (4) =		24.2138 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												88.7000 (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	371.5825	273.9283	217.8904	113.9368	43.9532	0.0000	0.0000	0.0000	0.0000	112.6565	251.5540	389.3718 (98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)
Space heating fuel (main heating system)	418.9205	308.8256	245.6487	128.4518	49.5527	0.0000	0.0000	0.0000	0.0000	127.0085	283.6009	438.9762 (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	205.8393	181.1771	190.4252	162.6591	154.3997	135.5687	131.2755	138.5270	142.2857	162.9004	178.3687	202.9798 (64)
Efficiency of water heater (217)m	83.7996	83.2625	82.3964	80.8960	78.6562	76.2000	76.2000	76.2000	76.2000	80.8586	83.0479	76.2000 (216)
Fuel for water heating, kWh/month	245.6328	217.5974	231.1087	201.0718	196.2968	177.9117	172.2776	181.7940	186.7266	201.4632	214.7781	241.7020 (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	10.2699	9.2760	10.2699	9.9386	10.2699	9.9386	10.2699	10.2699	9.9386	10.2699	9.9386	10.2699 (231)
Lighting	25.9411	20.8109	18.7380	13.7282	10.6041	8.6636	9.6734	12.5738	16.3322	21.4287	24.2037	26.6621 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-24.7097	-36.8889	-56.2623	-66.5676	-74.1060	-69.9816	-69.0578	-64.0030	-55.1832	-43.6179	-27.8019	-21.0676 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-10.5555	-23.5663	-50.2744	-80.2665	-109.9770	-111.8919	-110.0512	-90.8590	-63.3937	-34.7056	-14.3613	-8.2091 (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												2000.9848 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												76.2000
Water heating fuel used												2468.3607 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:

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(MEVDecentralised, Database: total watage = 3.5100, total flow = 21.0000, SFP = 0.1671)			
mechanical ventilation fans (SFP = 0.1671)			34.9195 (230a)
central heating pump			41.0000 (230c)
main heating flue fan			45.0000 (230e)
Total electricity for the above, kWh/year			120.9195 (231)
Electricity for lighting (calculated in Appendix L)			209.3599 (232)
Energy saving/generation technologies (Appendices M ,N and Q)			
PV generation			-1317.3590 (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			3482.2659 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2000.9848	0.2100	420.2068 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2468.3607	0.2100	518.3557 (264)
Space and water heating			938.5626 (265)
Pumps, fans and electric keep-hot	120.9195	0.1432	17.1608 (267)
Energy for lighting	209.3599	0.1490	31.1988 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-609.2474	0.1379	-83.9953
PV Unit electricity exported	-708.1116	0.1244	-88.0544
Total			-172.0497 (269)
Total CO2, kg/year			814.8724 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.1200 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2000.9848	1.1300	2261.1129 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2468.3607	1.1300	2789.2476 (278)
Space and water heating			5050.3604 (279)
Pumps, fans and electric keep-hot	120.9195	1.5335	184.7113 (281)
Energy for lighting	209.3599	1.5547	325.5011 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-609.2474	1.5140	-922.4036
PV Unit electricity exported	-708.1116	0.4564	-323.1711
Total			-1245.5747 (283)
Total Primary energy kWh/year			4314.9982 (286)
Dwelling Primary energy Rate (DPER)			58.8700 (287)

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

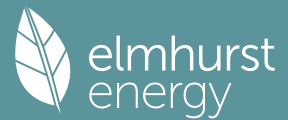
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	4.6900 (1b)	x 2.7200 (2b)	= 12.7568 (1b) - (3b)
First floor	68.6100 (1c)	x 2.3100 (2c)	= 158.4891 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 171.2459 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1752 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4252 (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) = 0.3614 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4608	0.4518	0.4427	0.3975	0.3885	0.3433	0.3433	0.3343	0.3614	0.3885	0.4066	0.4247 (22b)
	0.6062	0.6020	0.5980	0.5790	0.5755	0.5589	0.5589	0.5559	0.5653	0.5755	0.5827	0.5902 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.1600	1.0000	2.1600		(26)
TER Opening Type			12.6000	1.1450	14.4275		(27)
GF			4.6900	0.1300	0.6097		(28a)
Main	79.1892	14.7600	64.4292	0.1800	11.5973		(29a)
PIJ	68.6100		68.6100	0.1100	7.5471		(30)
Total net area of external elements Aum (A, m2)			152.4892				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	36.3415	(33)
Main dwelling							
Party Wall 1			32.7900	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							172.0799 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.0100	0.0500	0.5005
E3 Sill	10.0100	0.0500	0.5005
E4 Jamb	17.2900	0.0500	0.8645
E5 Ground floor (normal)	5.6400	0.1600	0.9024
E7 Party floor between dwellings (in blocks of flats)	27.6400	0.0700	1.9348
E16 Corner (normal)	7.3400	0.0900	0.6606
E18 Party wall between dwellings	10.0600	0.0600	0.6036
P1 Party wall - Ground floor	5.6400	0.0800	0.4512
E10 Eaves (insulation at ceiling level)	16.5700	0.0600	0.9942
E12 Gable (insulation at ceiling level)	11.0700	0.0600	0.6642
P4 Party wall - Roof (insulation at ceiling level)	7.5600	0.1200	0.9072
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.9837 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 45.3252 (37)

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

(38)m	Jan 34.2552	Feb 34.0222	Mar 33.7938	Apr 32.7212	May 32.5206	Jun 31.5864	Jul 31.5864	Aug 31.4134	Sep 31.9462	Oct 32.5206	Nov 32.9265	Dec 33.3510 (38)
Heat transfer coeff	79.5804	79.3474	79.1191	78.0465	77.8458	76.9116	76.9116	76.7386	77.2714	77.8458	78.2518	78.6762 (39)
Average = Sum(39)m / 12 =												78.0455
HLP	Jan 1.0857	Feb 1.0825	Mar 1.0794	Apr 1.0648	May 1.0620	Jun 1.0493	Jul 1.0493	Aug 1.0469	Sep 1.0542	Oct 1.0620	Nov 1.0676	Dec 1.0733 (40)
HLP (average)												1.0647
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

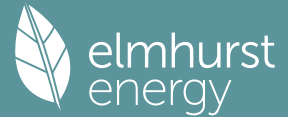
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3235 (42)
Hot water usage for mixer showers												62.9351 (42a)
63.1772	62.2278	60.8442	58.1972	56.2437	54.0652	52.8269	54.1999	55.7050	58.0441	60.7480		
Hot water usage for baths												27.1992 (42b)
27.2915	26.8862	26.3154	25.2630	24.4750	23.6012	23.1292	23.6960	24.3131	25.2481	26.3222		
Hot water usage for other uses												38.4250 (42c)
38.4250	37.0277	35.6305	34.2332	32.8359	31.4386	31.4386	32.8359	34.2332	35.6305	37.0277		118.4826 (43)
Average daily hot water use (litres/day)												
Daily hot water use	Jan 128.8937	Feb 126.1416	Mar 122.7901	Apr 117.6933	May 113.5546	Jun 109.1050	Jul 107.3947	Aug 110.7318	Sep 114.2513	Oct 118.9226	Nov 124.0979	Dec 128.5593 (44)
Energy conte	204.1361	179.6240	188.7238	161.1163	152.8663	134.1573	129.8846	137.1091	140.8833	161.3769	176.8002	201.2929 (45)
Energy content (annual)												Total = Sum(45)m = 1967.9708
Distribution loss (46)m = 0.15 x (45)m												30.6204
30.6204	26.9436	28.3086	24.1674	22.9299	20.1236	19.4827	20.5664	21.1325	24.2065	26.5200		30.1939 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
255.0950	225.6514	239.6827	210.4314	203.8252	183.4724	180.8435	188.0680	190.1984	212.3358	226.1153	252.2518	(62)
WWHRS	-28.8820	-25.5435	-26.7476	-22.1481	-20.6412	-17.6628	-16.5561	-17.6058	-18.2747	-21.5438	-24.4065	-28.3471 (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	226.2130	200.1080	212.9351	188.2833	183.1839	165.8095	164.2874	170.4623	171.9237	190.7920	201.7088	223.9047 (64)
12Total per year (kWh/year)												2299.6116 (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	80.6150	71.2318	75.4904	65.8999	63.5678	56.9361	55.9264	58.3285	59.1725	66.3975	71.1148	79.6696 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan 116.1752	Feb 116.1752	Mar 116.1752	Apr 116.1752	May 116.1752	Jun 116.1752	Jul 116.1752	Aug 116.1752	Sep 116.1752	Oct 116.1752	Nov 116.1752	Dec 116.1752 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
106.3651	117.7613	106.3651	109.9106	106.3651	109.9106	106.3651	106.3651	106.3651	109.9106	106.3651	109.9106	106.3651 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												

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Cooking gains	204.8733	206.9993	201.6420	190.2369	175.8400	162.3090	153.2695	151.1435	156.5008	167.9059	182.3028	195.8338 (68)
Pumps, fans	34.6175	34.6175	34.6175	34.6175	34.6175	34.6175	34.6175	34.6175	34.6175	34.6175	34.6175	34.6175 (69)
Losses e.g. evaporation	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Water heating gains	-92.9401	-92.9401	-92.9401	-92.9401	-92.9401	-92.9401	-92.9401	-92.9401	-92.9401	-92.9401	-92.9401	-92.9401 (71)
Total internal gains	108.3534	105.9998	101.4656	91.5277	85.4405	79.0779	75.1698	78.3985	82.1840	89.2440	98.7706	107.0828 (72)
	480.4444	491.6129	470.3252	452.5277	428.4982	409.1500	392.6569	393.7596	406.4479	424.3675	451.8365	470.1342 (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				3.6500	11.2829	0.6300	0.7000	0.7700	12.5860 (75)			
Southeast				1.3600	36.7938	0.6300	0.7000	0.7700	15.2928 (77)			
Southwest				7.5900	36.7938	0.6300	0.7000	0.7700	85.3471 (79)			
Solar gains	113.2258	197.0460	280.7112	366.4273	427.4178	431.7996	413.1911	366.5471	310.2157	220.7718	136.3797	96.4051 (83)
Total gains	593.6702	688.6589	751.0364	818.9550	855.9159	840.9496	805.8480	760.3067	716.6636	645.1393	588.2162	566.5393 (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	44.0276	44.1569	44.2844	44.8930	45.0087	45.5554	45.5554	45.6581	45.3432	45.0087	44.7752	44.5336
alpha	3.9352	3.9438	3.9523	3.9929	4.0006	4.0370	4.0370	4.0439	4.0229	4.0006	3.9850	3.9689
util living area	0.9763	0.9577	0.9262	0.8523	0.7282	0.5554	0.4125	0.4529	0.6690	0.8793	0.9584	0.9799 (86)
MIT	19.5228	19.7809	20.1084	20.5119	20.8003	20.9499	20.9881	20.9827	20.8933	20.5196	19.9626	19.4842 (87)
Th 2	20.0125	20.0151	20.0177	20.0297	20.0320	20.0425	20.0425	20.0444	20.0384	20.0320	20.0274	20.0227 (88)
util rest of house	0.9713	0.9490	0.9109	0.8225	0.6771	0.4823	0.3261	0.3637	0.5974	0.8482	0.9483	0.9756 (89)
MIT 2	18.3082	18.6334	19.0413	19.5339	19.8563	20.0094	20.0374	20.0365	19.9601	19.5561	18.8744	18.2665 (90)
Living area fraction	18.6245	18.9322	19.3192	19.7886	20.1021	20.2543	20.2850	20.2829	20.2031	19.8070	19.1578	18.5836 (91)
MIT	18.6245	18.9322	19.3192	19.7886	20.1021	20.2543	20.2850	20.2829	20.2031	19.8070	19.1578	18.5836 (92)
Temperature adjustment	18.6245	18.9322	19.3192	19.7886	20.1021	20.2543	20.2850	20.2829	20.2031	19.8070	19.1578	18.5836 (93)
adjusted MIT	18.6245	18.9322	19.3192	19.7886	20.1021	20.2543	20.2850	20.2829	20.2031	19.8070	19.1578	18.5836 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9617	0.9368	0.8978	0.8142	0.6811	0.4991	0.3483	0.3865	0.6104	0.8398	0.9367	0.9669 (94)
Ext temp.	570.9302	645.1092	674.2493	666.8146	582.9478	419.6795	280.6993	293.8298	437.4772	541.7629	550.9903	547.7786 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Space heating kWh	1139.9512	1113.4226	1014.2462	849.8170	654.0716	434.8841	283.4179	297.9687	471.5979	716.7265	943.5466	1131.6508 (97)
Space heating requirement - total per year (kWh/year)	423.3516	314.7066	252.9577	131.7617	52.9161	0.0000	0.0000	0.0000	0.0000	130.1729	282.6406	434.4009 (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)	423.3516	314.7066	252.9577	131.7617	52.9161	0.0000	0.0000	0.0000	0.0000	130.1729	282.6406	434.4009 (98c)
Space heating requirement after solar 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 (99)
Space heating per m ²	(98c) / (4) = 27.5977 (99)											

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)											
Fraction of space heat from main system(s)	1.0000 (202)											
Efficiency of main space heating system 1 (in %)	92.4000 (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
423.3516	314.7066	252.9577	131.7617	52.9161	0.0000	0.0000	0.0000	0.0000	0.0000	130.1729	282.6406	434.4009 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	458.1728	340.5915	273.7637	142.5993	57.2686	0.0000	0.0000	0.0000	0.0000	140.8798	305.8881	470.1308 (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	226.2130	200.1080	212.9351	188.2833	183.1839	165.8095	164.2874	170.4623	171.9237	190.7920	201.7088	223.9047 (64)
Water heating requirement	85.7035	85.3471	84.7515	83.6307	82.0796	80.3000	80.3000	80.3000	80.3000	83.5791	85.1042	85.7755 (217)
Efficiency of water heater (217)m	263.9484	234.4637	251.2464	225.1364	223.1784	206.4876	204.5921	212.2818	214.1017	228.2771	237.0138	261.0357 (219)
Fuel for water heating, kWh/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 (221)
Space cooling fuel requirement (221)m	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.3041	7.3041	7.0685	7.3041 (231)
Pumps and Fa	22.1006	17.7299	15.9638	11.6958	9.0341	7.3810	8.2412	10.7123	13.9142	18.2562	20.6203	22.7148 (232)
Lighting	Electricity generated by PVs (Appendix M) (negative quantity)											

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(233a)m	-34.3412	-48.4410	-69.6733	-78.3987	-84.6009	-78.9988	-78.0291	-73.6349	-65.8847	-55.4231	-37.7660	-29.6875	(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	-19.3216	-40.6568	-80.8259	-121.4182	-160.5636	-161.3275	-159.4221	-134.9688	-98.9151	-58.1434	-25.7981	-15.2777	(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												2189.2945	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2761.7631	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												178.3642	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1811.5181	(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												3403.9037	(238)

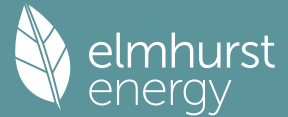
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2189.2945	0.2100	459.7518 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2761.7631	0.2100	579.9703 (264)
Space and water heating			1039.7221 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	178.3642	0.1443	25.7435 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-734.8793	0.1346	-98.8919
PV Unit electricity exported	-1076.6388	0.1259	-135.5397
Total			-234.4317 (269)
Total CO2, kg/year			842.9632 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.5000 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2189.2945	1.1300	2473.9028 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2761.7631	1.1300	3120.7923 (278)
Space and water heating			5594.6951 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	178.3642	1.5338	273.5809 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-734.8793	1.4973	-1100.3664
PV Unit electricity exported	-1076.6388	0.4621	-497.5239
Total			-1597.8904 (283)
Total Primary energy kWh/year			4400.4865 (286)
Target Primary Energy Rate (TPER)			60.0300 (287)

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Property Reference	APT-01			Issued on Date	07/05/2025
Assessment Reference	001	Prop Type Ref			
Property	Highmoor Lane, CLECKHEATON, BD19 6LW				
SAP Rating	92 A	DER	11.12	TER	11.50
Environmental	91 B	% DER < TER			3.30
CO ₂ Emissions (t/year)	0.8	DFEE	32.46	TFEE	33.33
Compliance Check	See BREL	% DFEE < TFEE			2.59
% DPER < TPER	1.94	DPER	58.87	TPER	60.03
Assessor Details	Mr. Paul Goddard			Assessor ID	B342-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	4.6900 (1b)	x 2.7200 (2b)	= 12.7568 (1b) - (3b)
First floor	68.6100 (1c)	x 2.3100 (2c)	= 158.4891 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	171.2459 (5)

2. Ventilation rate

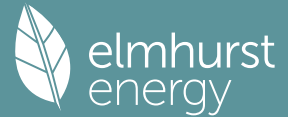
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1752 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3752 (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) = 0.3189 (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	0.4066	0.3986	0.3907	0.3508	0.3428	0.3030	0.3030	0.2950	0.3189	0.3428	0.3588	0.3747 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5827	0.5795	0.5763	0.5615	0.5588	0.5459	0.5459	0.5435	0.5509	0.5588	0.5644	0.5702 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			2.1600	1.0000	2.1600		(26)
Window			7.0300	1.1450	8.0496		(27)
Patio Door			5.5700	1.3258	7.3845		(27)
GF			4.6900	0.1100	0.5159	9.0000	42.2100 (28a)
Main	79.1892	14.7600	64.4292	0.1800	11.5973	18.0000	1159.7255 (29a)
PIJ	68.6100		68.6100	0.0900	6.1749	9.0000	617.4900 (30)
Total net area of external elements Aum(A, m ²)			152.4892				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.8821		(33)
Main dwelling							
Party Wall 1			32.7900	0.0000	0.0000	20.0000	655.8000 (32)
Party Floor 1			63.9200			30.0000	1917.6000 (32d)
Internal Wall 1			107.9200			75.0000	8093.9999 (32c)
Internal Floor 1			4.6900			18.0000	84.4200 (32d)
Internal Ceiling 1			4.6900			9.0000	42.2100 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	12613.4554 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							172.0799 (35)

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List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.0100	0.0500	0.5005
E3 Sill	10.0100	0.0500	0.5005
E4 Jamb	17.2900	0.0500	0.8645
E5 Ground floor (normal)	5.6400	0.1000	0.5640
E7 Party floor between dwellings (in blocks of flats)	27.6400	0.0700	1.9348
E16 Corner (normal)	7.3400	0.0900	0.6606
E18 Party wall between dwellings	10.0600	0.0600	0.6036
P1 Party wall - Ground floor	5.6400	0.0800	0.4512
E10 Eaves (insulation at ceiling level)	16.5700	0.0600	0.9942
E12 Gable (insulation at ceiling level)	11.0700	0.0600	0.6642
P4 Party wall - Roof (insulation at ceiling level)	7.5600	0.1200	0.9072
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.6453 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	44.5274 (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	32.9271	32.7457	32.5679	31.7327	31.5765	30.8491	30.8491	30.7144	31.1292	31.5765	31.8926	32.2230 (38)
Heat transfer coeff	77.4545	77.2731	77.0953	76.2602	76.1039	75.3765	75.3765	75.2418	75.6567	76.1039	76.4200	76.7505 (39)
Average = Sum(39)m / 12 =												76.2594
HLP	1.0567	1.0542	1.0518	1.0404	1.0383	1.0283	1.0283	1.0265	1.0322	1.0383	1.0426	1.0471 (40)
HLP (average)												1.0404
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3235 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	27.2915	26.8862	26.3154	25.2630	24.4750	23.6012	23.1292	23.6960	24.3131	25.2481	26.3222	27.1992 (42b)
Hot water usage for other uses	38.4250	37.0277	35.6305	34.2332	32.8359	31.4386	31.4386	32.8359	34.2332	35.6305	37.0277	38.4250 (42c)
Average daily hot water use (litres/day)												60.2353 (43)
Daily hot water use	65.7165	63.9139	61.9458	59.4962	57.3109	55.0398	54.5678	56.5319	58.5463	60.8785	63.3499	65.6242 (44)
Energy conte	104.0788	91.0125	95.2085	81.4473	77.1515	67.6779	65.9951	69.9983	72.1934	82.6116	90.2535	102.7517 (45)
Energy content (annual)										Total = Sum(45)m =		1000.3800
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Total heat required for water heating calculated for each month												
WWHRS	88.4670	77.3607	80.9272	69.2302	65.5787	57.5262	56.0958	59.4985	61.3644	70.2199	76.7155	87.3389 (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	88.4670	77.3607	80.9272	69.2302	65.5787	57.5262	56.0958	59.4985	61.3644	70.2199	76.7155	87.3389 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		850.3230 (64)
Electric shower(s)	50.5944	45.0800	49.2257	46.9754	47.8569	45.6509	47.1726	47.8569	46.9754	49.2257	48.3000	50.5944 (64a)
Heat gains from water heating, kWh/month	34.7654	30.6102	32.5382	29.0514	28.3589	25.7943	25.8171	26.8389	27.0850	29.8614	31.2539	34.4833 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	116.1752	116.1752	116.1752	116.1752	116.1752	116.1752	116.1752	116.1752	116.1752	116.1752	116.1752	116.1752 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	106.3651	117.7613	106.3651	109.9106	106.3651	109.9106	106.3651	109.9106	106.3651	109.9106	106.3651	106.3651 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	204.8733	206.9993	201.6420	190.2369	175.8400	162.3090	153.2695	151.1435	156.5008	167.9059	182.3028	195.8338 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6175	34.6175	34.6175	34.6175	34.6175	34.6175	34.6175	34.6175	34.6175	34.6175	34.6175	34.6175 (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)	-92.9401	-92.9401	-92.9401	-92.9401	-92.9401	-92.9401	-92.9401	-92.9401	-92.9401	-92.9401	-92.9401	-92.9401 (71)
Water heating gains (Table 5)	46.7276	45.5508	43.7342	40.3492	38.1168	35.8254	34.7004	36.0737	37.6180	40.1363	43.4082	46.3486 (72)
Total internal gains	415.8186	428.1640	409.5937	398.3492	378.1745	365.8975	352.1874	351.4349	361.8819	372.2598	393.4740	406.4000 (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	3.6500	11.2829	0.3300	0.0000	0.7700	10.4645 (75)
Southeast	1.3600	36.7938	0.3300	0.0000	0.7700	12.7151 (77)
Southwest	2.0200	36.7938	0.3300	0.0000	0.7700	18.8856 (79)
Southwest	5.5700	36.7938	0.6300	0.7000	0.7700	62.6328 (79)

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Solar gains	104.6980	181.8154	258.0004	335.1502	389.5212	392.9176	376.2288	334.7157	284.5687	203.4341	126.0371	89.1901 (83)
Total gains	520.5166	609.9794	667.5941	733.4994	767.6957	758.8151	728.4163	686.1506	646.4506	575.6939	519.5112	495.5901 (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	45.2361	45.3423	45.4468	45.9445	46.0389	46.4832	46.4832	46.5664	46.3110	46.0389	45.8484	45.6510
alpha	4.0157	4.0228	4.0298	4.0630	4.0693	4.0989	4.0989	4.1044	4.0874	4.0693	4.0566	4.0434
util living area	0.9844	0.9702	0.9455	0.8825	0.7688	0.5956	0.4453	0.4889	0.7097	0.9068	0.9712	0.9870 (86)
MIT	19.4492	19.7041	20.0326	20.4510	20.7656	20.9391	20.9854	20.9787	20.8736	20.4626	19.8889	19.4074 (87)
Th 2	20.0364	20.0384	20.0404	20.0498	20.0516	20.0598	20.0598	20.0613	20.0566	20.0516	20.0480	20.0443 (88)
util rest of house	0.9809	0.9638	0.9335	0.8569	0.7207	0.5212	0.3546	0.3958	0.6396	0.8808	0.9638	0.9841 (89)
MIT 2	18.6302	18.8824	19.2041	19.6078	19.8874	20.0277	20.0548	20.0535	19.9824	19.6283	19.0742	18.5948 (90)
Living area fraction	18.8435	19.0964	19.4199	19.8274	20.1161	20.2651	20.2972	20.2944	20.2145	19.8456	19.2864	18.8064 (92)
MIT	18.8435	19.0964	19.4199	19.8274	20.1161	20.2651	20.2972	20.2944	20.2145	19.8456	19.2864	18.8064 (93)
Temperature adjustment												0.0000
adjusted MIT	18.8435	19.0964	19.4199	19.8274	20.1161	20.2651	20.2972	20.2944	20.2145	19.8456	19.2864	18.8064 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9753	0.9558	0.9241	0.8501	0.7242	0.5381	0.3779	0.4195	0.6522	0.8741	0.9563	0.9791 (94)
Useful gains	507.6376	583.0224	616.9240	623.5513	555.9801	408.3269	275.3012	287.8460	421.6299	503.2344	496.8021	485.2283 (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	1126.4601	1096.9999	996.0615	833.3262	640.4974	427.0125	278.6785	293.0225	462.6032	703.6232	931.2824	1121.0514 (97)
Space heating kWh	460.4040	345.3929	282.0783	151.0379	62.8809	0.0000	0.0000	0.0000	0.0000	149.0892	312.8258	473.0524 (98a)
Space heating requirement - total per year (kWh/year)												2236.7614
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	460.4040	345.3929	282.0783	151.0379	62.8809	0.0000	0.0000	0.0000	0.0000	149.0892	312.8258	473.0524 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2236.7614
Space heating per m2												30.5152 (99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	708.5391	557.7861	571.8377	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8674	0.9210	0.9007	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	614.5750	513.6934	515.0549	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	844.3730	810.9994	763.6930	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	165.4546	221.1956	184.9868	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	41.3637	55.2989	46.2467	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												142.9093 (107)
Energy for space heating												30.5152 (99)
Energy for space cooling												1.9496 (108)
Total												32.4648 (109)
Fabric Energy Efficiency (DFEE)												32.5 (109)

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

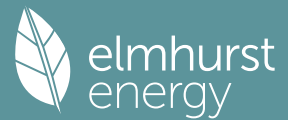
1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	4.6900 (1b)	x 2.7200 (2b)	= 12.7568 (1b) - (3b)
First floor	68.6100 (1c)	x 2.3100 (2c)	= 158.4891 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	171.2459 (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)

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Number of blocked chimneys
Number of intermittent extract fans
Number of passive vents
Number of flueless gas fires

0 * 20 = 0.0000 (6f)
3 * 10 = 30.0000 (7a)
0 * 10 = 0.0000 (7b)
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 AF50
Infiltration rate
Number of sides sheltered

Air changes per hour
30.0000 / (5) = 0.1752 (8)
Yes
Blower Door
5.0000 (17)
0.4252 (18)
2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3614 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infiltr rate	0.4608	0.4518	0.4427	0.3975	0.3885	0.3433	0.3433	0.3343	0.3614	0.3885	0.4066	0.4247	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													(23c)
Effective ac	0.6062	0.6020	0.5980	0.5790	0.5755	0.5589	0.5589	0.5559	0.5653	0.5755	0.5827	0.5902	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.1600	1.0000	2.1600		(26)
TER Opening Type			12.6000	1.1450	14.4275		(27)
GF			4.6900	0.1300	0.6097		(28a)
Main	79.1892	14.7600	64.4292	0.1800	11.5973		(29a)
PIJ	68.6100		68.6100	0.1100	7.5471		(30)
Total net area of external elements Aum(A, m2)			152.4892				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.3415		(33)
Main dwelling							
Party Wall 1			32.7900	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							172.0799 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.0100	0.0500	0.5005
E3 Sill	10.0100	0.0500	0.5005
E4 Jamb	17.2900	0.0500	0.8645
E5 Ground floor (normal)	5.6400	0.1600	0.9024
E7 Party floor between dwellings (in blocks of flats)	27.6400	0.0700	1.9348
E16 Corner (normal)	7.3400	0.0900	0.6606
E18 Party wall between dwellings	10.0600	0.0600	0.6036
P1 Party wall - Ground floor	5.6400	0.0800	0.4512
E10 Eaves (insulation at ceiling level)	16.5700	0.0600	0.9942
E12 Gable (insulation at ceiling level)	11.0700	0.0600	0.6642
P4 Party wall - Roof (insulation at ceiling level)	7.5600	0.1200	0.9072
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.9837 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 45.3252 (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	34.2552	34.0222	33.7938	32.7212	32.5206	31.5864	31.5864	31.4134	31.9462	32.5206	32.9265	33.3510	(38)
Heat transfer coeff	79.5804	79.3474	79.1191	78.0465	77.8458	76.9116	76.9116	76.7386	77.2714	77.8458	78.2518	78.6762	(39)
Average = Sum(39)m / 12 =													78.0455

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0857	1.0825	1.0794	1.0648	1.0620	1.0493	1.0493	1.0469	1.0542	1.0620	1.0676	1.0733	(40)
HLP (average)													1.0647
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3235 (42)

Hot water usage for mixer showers 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (42a)

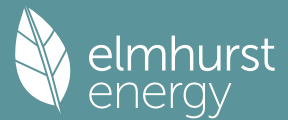
Hot water usage for baths 27.2915 26.8862 26.3154 25.2630 24.4750 23.6012 23.1292 23.6960 24.3131 25.2481 26.3222 27.1992 (42b)

Hot water usage for other uses 38.4250 37.0277 35.6305 34.2332 32.8359 31.4386 31.4386 32.8359 34.2332 35.6305 37.0277 38.4250 (42c)

Average daily hot water use (litres/day) 60.2353 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.7165	63.9139	61.9458	59.4962	57.3109	55.0398	54.5678	56.5319	58.5463	60.8785	63.3499	65.6242	(44)
Energy conte	104.0788	91.0125	95.2085	81.4473	77.1515	67.6779	65.9951	69.9983	72.1934	82.6116	90.2535	102.7517	(45)
Energy content (annual)										Total = Sum(45)m =			1000.3800
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	88.4670	77.3607	80.9272	69.2302	65.5787	57.5262	56.0958	59.4985	61.3644	70.2199	76.7155	87.3389	(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	88.4670	77.3607	80.9272	69.2302	65.5787	57.5262	56.0958	59.4985	61.3644	70.2199	76.7155	87.3389	(64)
Total per year (kWh/year) = Sum(64)m =													850.3230 (64)

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12Total per year (kWh/year)	850 (64)										
Electric shower(s)	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =										
50.5944	45.0800	49.2257	46.9754	47.8569	45.6509	47.1726	47.8569	46.9754	49.2257	48.3000	50.5944 (64a)
Heat gains from water heating, kWh/month											575.5083 (64a)
34.7654	30.6102	32.5382	29.0514	28.3589	25.7943	25.8171	26.8389	27.0850	29.8614	31.2539	34.4833 (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
(66)m	116.1752	116.1752	116.1752	116.1752	116.1752	116.1752	116.1752	116.1752	116.1752	116.1752	116.1752 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	106.3651	117.7613	106.3651	109.9106	106.3651	109.9106	106.3651	106.3651	109.9106	106.3651	109.9106 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	204.8733	206.9993	201.6420	190.2369	175.8400	162.3090	153.2695	151.1435	156.5008	167.9059	182.3028 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6175	34.6175	34.6175	34.6175	34.6175	34.6175	34.6175	34.6175	34.6175	34.6175	34.6175 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-92.9401	-92.9401	-92.9401	-92.9401	-92.9401	-92.9401	-92.9401	-92.9401	-92.9401	-92.9401	-92.9401 (71)
Water heating gains (Table 5)	46.7276	45.5508	43.7342	40.3492	38.1168	35.8254	34.7004	36.0737	37.6180	40.1363	43.4082 (72)
Total internal gains	415.8186	428.1640	409.5937	398.3492	378.1745	365.8975	352.1874	351.4349	361.8819	372.2598	393.4740 (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					3.6500	11.2829		0.6300	0.7000	0.7700		12.5860 (75)
Southeast					1.3600	36.7938		0.6300	0.7000	0.7700		15.2928 (77)
Southwest					7.5900	36.7938		0.6300	0.7000	0.7700		85.3471 (79)
Solar gains	113.2258	197.0460	280.7112	366.4273	427.4178	431.7996	413.1911	366.5471	310.2157	220.7718	136.3797	96.4051 (83)
Total gains	529.0444	625.2100	690.3050	764.7765	805.5922	797.6971	765.3786	717.9819	672.0976	593.0316	529.8538	502.8050 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)											
Utilisation factor for gains for living area, nil,m (see Table 9a)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
tau	44.0276	44.1569	44.2844	44.8930	45.0087	45.5554	45.5554	45.6581	45.3432	45.0087	44.7752
alpha	3.9352	3.9438	3.9523	3.9929	4.0006	4.0370	4.0370	4.0439	4.0229	4.0006	3.9850
util living area	0.9838	0.9686	0.9418	0.8742	0.7552	0.5802	0.4329	0.4771	0.6993	0.9024	0.9700
MIT	19.4062	19.6744	20.0186	20.4535	20.7708	20.9415	20.9858	20.9792	20.8745	20.4559	19.8639
Th 2	20.0125	20.0151	20.0177	20.0297	20.0320	20.0425	20.0425	20.0444	20.0384	20.0320	20.0274
util rest of house	0.9802	0.9618	0.9291	0.8472	0.7055	0.5055	0.3428	0.3842	0.6280	0.8753	0.9623
MIT 2	18.5699	18.8354	19.1724	19.5923	19.8728	20.0120	20.0377	20.0369	19.9654	19.6054	19.0340
Living area fraction	FLA = Living area / (4) =										
MIT	18.7877	19.0539	19.3927	19.8166	20.1067	20.2541	20.2846	20.2823	20.2022	19.8269	19.2501
Temperature adjustment	0.0000										
adjusted MIT	18.7877	19.0539	19.3927	19.8166	20.1067	20.2541	20.2846	20.2823	20.2022	19.8269	19.2501

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Utilisation	0.9742	0.9534	0.9192	0.8404	0.7096	0.5227	0.3660	0.4079	0.6411	0.8686	0.9545
Useful gains	515.4027	596.0908	634.5624	642.7371	571.6864	416.9378	280.1367	292.8892	430.8516	515.0870	505.7205
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000
Heat loss rate W	1152.9357	1123.0765	1020.0620	852.0032	654.4269	434.8631	283.3915	297.9203	471.5233	718.2742	950.7706
Space heating kWh	474.3246	354.1344	286.8117	150.6717	61.5589	0.0000	0.0000	0.0000	0.0000	151.1713	320.4361
Space heating requirement - total per year (kWh/year)	2285.1234										
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
Solar heating contribution - total per year (kWh/year)	0.0000										
Space heating kWh	474.3246	354.1344	286.8117	150.6717	61.5589	0.0000	0.0000	0.0000	0.0000	151.1713	320.4361
Space heating requirement after solar contribution - total per year (kWh/year)	2285.1234										
Space heating per m2	(98c) / (4) =										

8c. Space cooling requirement

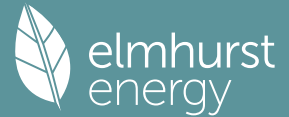
Calculated for June, July and August. See Table 10b											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	722.9691	569.1459	583.2134	0.0000	0.0000	0.0000
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8750	0.9256	0.9056	0.0000	0.0000	0.0000
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	632.5891	526.7937	528.1332	0.0000	0.0000	0.0000
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	889.8196	854.2020	800.8985	0.0000	0.0000	0.0000
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	185.2059	243.5918	202.9374	0.0000	0.0000	0.0000
Cooled fraction	fc = cooled area / (4) =										
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500
Space cooling kWh	1.0000 (105)										

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	0.0000	0.0000	0.0000	0.0000	0.0000	46.3015	60.8979	50.7343	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement													157.9338 (107)
Energy for space heating													31.1749 (99)
Energy for space cooling													2.1546 (108)
Total													33.3296 (109)
Fabric Energy Efficiency (TFEE)													33.3 (109)

Full SAP Calculation Printout



Property Reference	APT-01			Issued on Date	07/05/2025
Assessment Reference	001	Prop Type Ref			
Property	Highmoor Lane, CLECKHEATON, BD19 6LW				
SAP Rating	92 A	DER	11.12	TER	11.50
Environmental	91 B	% DER < TER			3.30
CO ₂ Emissions (t/year)	0.8	DFEE	32.46	TFEE	33.33
Compliance Check	See BREL	% DFEE < TFEE			2.59
% DPER < TPER	1.94	DPER	58.87	TPER	60.03
Assessor Details	Mr. Paul Goddard			Assessor ID	B342-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	4.6900 (1b)	x 2.7200 (2b)	= 12.7568 (1b) - (3b)
First floor	68.6100 (1c)	x 2.3100 (2c)	= 158.4891 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	171.2459 (5)

2. Ventilation rate

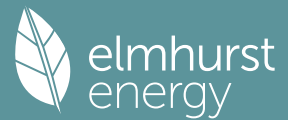
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.2000 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1700 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			2.1600	1.0000	2.1600		(26)
Window			7.0300	1.1450	8.0496		(27)
Patio Door			5.5700	1.3258	7.3845		(27)
GF			4.6900	0.1100	0.5159	9.0000	42.2100 (28a)
Main	79.1892	14.7600	64.4292	0.1800	11.5973	18.0000	1159.7255 (29a)
PIJ	68.6100		68.6100	0.0900	6.1749	9.0000	617.4900 (30)
Total net area of external elements Aum(A, m ²)			152.4892				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.8821		(33)
Main dwelling							
Party Wall 1			32.7900	0.0000	0.0000	20.0000	655.8000 (32)
Party Floor 1			63.9200			30.0000	1917.6000 (32d)
Internal Wall 1			107.9200			75.0000	8093.9999 (32c)
Internal Floor 1			4.6900			18.0000	84.4200 (32d)
Internal Ceiling 1			4.6900			9.0000	42.2100 (32e)

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Solar gains	104.6980	181.8154	258.0004	335.1502	389.5212	392.9176	376.2288	334.7157	284.5687	203.4341	126.0371	89.1901 (83)
Total gains	568.5915	656.8828	711.7739	771.0903	801.4114	785.4343	752.2298	711.8285	674.3802	611.1902	561.2949	542.7679 (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	48.1395	48.1395	48.1395	48.1395	48.1395	48.1395	48.1395	48.1395	48.1395	48.1395	48.1395	48.1395
alpha	4.2093	4.2093	4.2093	4.2093	4.2093	4.2093	4.2093	4.2093	4.2093	4.2093	4.2093	4.2093
util living area	0.9778	0.9596	0.9288	0.8576	0.7344	0.5644	0.4189	0.4597	0.6746	0.8835	0.9609	0.9815 (86)
MIT	19.6697	19.9077	20.2047	20.5575	20.8219	20.9546	20.9897	20.9848	20.9047	20.5624	20.0472	19.6081 (87)
Th 2	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892 (88)
util rest of house	0.9732	0.9514	0.9144	0.8294	0.6857	0.4937	0.3353	0.3733	0.6058	0.8540	0.9515	0.9776 (89)
MIT 2	18.5469	18.8454	19.2137	19.6367	19.9311	20.0588	20.0847	20.0820	20.0183	19.6525	19.0246	18.4692 (90)
Living area fraction									fLA =	Living area / (4) =		0.2604 (91)
MIT	18.8393	19.1220	19.4718	19.8765	20.1631	20.2921	20.3204	20.3171	20.2492	19.8895	19.2909	18.7658 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.6893	18.9720	19.3218	19.7265	20.0131	20.1421	20.1704	20.1671	20.0992	19.7395	19.1409	18.6158 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9635	0.9386	0.8997	0.8167	0.6813	0.4980	0.3429	0.3809	0.6066	0.8406	0.9389	0.9689 (94)
Useful gains	547.8611	616.5742	640.3486	629.7421	545.9735	391.1173	257.9165	271.1227	409.0761	513.7778	526.9940	525.8791 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	14.0000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1047.3000	1024.2056	933.2120	787.9876	605.0504	403.3703	259.8635	274.1829	436.6386	665.1979	876.3745	1049.2283 (97)
Space heating kWh	371.5825	273.9283	217.8904	113.9368	43.9532	0.0000	0.0000	0.0000	0.0000	112.6565	251.5540	389.3718 (98a)
Space heating requirement - total per year (kWh/year)												1774.8735
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	371.5825	273.9283	217.8904	113.9368	43.9532	0.0000	0.0000	0.0000	0.0000	112.6565	251.5540	389.3718 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1774.8735
Space heating per m2										(98c) / (4) =		24.2138 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												88.7000 (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	371.5825	273.9283	217.8904	113.9368	43.9532	0.0000	0.0000	0.0000	0.0000	112.6565	251.5540	389.3718 (98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)
Space heating fuel (main heating system)	418.9205	308.8256	245.6487	128.4518	49.5527	0.0000	0.0000	0.0000	0.0000	127.0085	283.6009	438.9762 (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	205.8393	181.1771	190.4252	162.6591	154.3997	135.5687	131.2755	138.5270	142.2857	162.9004	178.3687	202.9798 (64)
Efficiency of water heater (217)m	83.7996	83.2625	82.3964	80.8960	78.6562	76.2000	76.2000	76.2000	76.2000	80.8586	83.0479	76.2000 (216)
Fuel for water heating, kWh/month	245.6328	217.5974	231.1087	201.0718	196.2968	177.9117	172.2776	181.7940	186.7266	201.4632	214.7781	241.7020 (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	10.2699	9.2760	10.2699	9.9386	10.2699	9.9386	10.2699	10.2699	9.9386	10.2699	9.9386	10.2699 (231)
Lighting	25.9411	20.8109	18.7380	13.7282	10.6041	8.6636	9.6734	12.5738	16.3322	21.4287	24.2037	26.6621 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-24.7097	-36.8889	-56.2623	-66.5676	-74.1060	-69.9816	-69.0578	-64.0030	-55.1832	-43.6179	-27.8019	-21.0676 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-10.5555	-23.5663	-50.2744	-80.2665	-109.9770	-111.8919	-110.0512	-90.8590	-63.3937	-34.7056	-14.3613	-8.2091 (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												2000.9848 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												76.2000
Water heating fuel used												2468.3607 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:

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(MEVDecentralised, Database: total watage = 3.5100, total flow = 21.0000, SFP = 0.1671)			
mechanical ventilation fans (SFP = 0.1671)			34.9195 (230a)
central heating pump			41.0000 (230c)
main heating flue fan			45.0000 (230e)
Total electricity for the above, kWh/year			120.9195 (231)
Electricity for lighting (calculated in Appendix L)			209.3599 (232)
Energy saving/generation technologies (Appendices M ,N and Q)			
PV generation			-1317.3590 (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			3482.2659 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2000.9848	0.2100	420.2068 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2468.3607	0.2100	518.3557 (264)
Space and water heating			938.5626 (265)
Pumps, fans and electric keep-hot	120.9195	0.1432	17.1608 (267)
Energy for lighting	209.3599	0.1490	31.1988 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-609.2474	0.1379	-83.9953
PV Unit electricity exported	-708.1116	0.1244	-88.0544
Total			-172.0497 (269)
Total CO2, kg/year			814.8724 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.1200 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2000.9848	1.1300	2261.1129 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2468.3607	1.1300	2789.2476 (278)
Space and water heating			5050.3604 (279)
Pumps, fans and electric keep-hot	120.9195	1.5335	184.7113 (281)
Energy for lighting	209.3599	1.5547	325.5011 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-609.2474	1.5140	-922.4036
PV Unit electricity exported	-708.1116	0.4564	-323.1711
Total			-1245.5747 (283)
Total Primary energy kWh/year			4314.9982 (286)
Dwelling Primary energy Rate (DPER)			58.8700 (287)

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

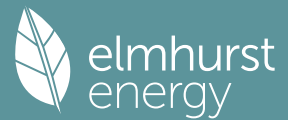
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	4.6900 (1b)	x 2.7200 (2b)	= 12.7568 (1b) - (3b)
First floor	68.6100 (1c)	x 2.3100 (2c)	= 158.4891 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 171.2459 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1752 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4252 (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) = 0.3614 (21)

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Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Effective ac	0.4608	0.4518	0.4427	0.3975	0.3885	0.3433	0.3433	0.3343	0.3614	0.3885	0.4066	0.4247 (22b)
	0.6062	0.6020	0.5980	0.5790	0.5755	0.5589	0.5589	0.5559	0.5653	0.5755	0.5827	0.5902 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.1600	1.0000	2.1600		(26)
TER Opening Type			12.6000	1.1450	14.4275		(27)
GF			4.6900	0.1300	0.6097		(28a)
Main	79.1892	14.7600	64.4292	0.1800	11.5973		(29a)
PIJ	68.6100		68.6100	0.1100	7.5471		(30)
Total net area of external elements Aum (A, m2)			152.4892				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	36.3415	(33)
Main dwelling							
Party Wall 1			32.7900	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							172.0799 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.0100	0.0500	0.5005
E3 Sill	10.0100	0.0500	0.5005
E4 Jamb	17.2900	0.0500	0.8645
E5 Ground floor (normal)	5.6400	0.1600	0.9024
E7 Party floor between dwellings (in blocks of flats)	27.6400	0.0700	1.9348
E16 Corner (normal)	7.3400	0.0900	0.6606
E18 Party wall between dwellings	10.0600	0.0600	0.6036
P1 Party wall - Ground floor	5.6400	0.0800	0.4512
E10 Eaves (insulation at ceiling level)	16.5700	0.0600	0.9942
E12 Gable (insulation at ceiling level)	11.0700	0.0600	0.6642
P4 Party wall - Roof (insulation at ceiling level)	7.5600	0.1200	0.9072
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.9837 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 45.3252 (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	34.2552	34.0222	33.7938	32.7212	32.5206	31.5864	31.5864	31.4134	31.9462	32.5206	32.9265	33.3510 (38)
Average = Sum(39)m / 12 =	79.5804	79.3474	79.1191	78.0465	77.8458	76.9116	76.9116	76.7386	77.2714	77.8458	78.2518	78.6762 (39)
												78.0455
HLP	1.0857	1.0825	1.0794	1.0648	1.0620	1.0493	1.0493	1.0469	1.0542	1.0620	1.0676	1.0733 (40)
HLP (average)												1.0647
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

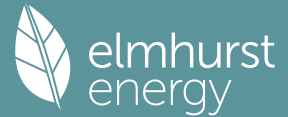
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3235 (42)
Hot water usage for mixer showers												62.9351 (42a)
Hot water usage for baths												27.1992 (42b)
Hot water usage for other uses												38.4250 (42c)
Average daily hot water use (litres/day)												118.4826 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	128.8937	126.1416	122.7901	117.6933	113.5546	109.1050	107.3947	110.7318	114.2513	118.9226	124.0979	128.5593 (44)
Energy content (annual)	204.1361	179.6240	188.7238	161.1163	152.8663	134.1573	129.8846	137.1091	140.8833	161.3769	176.8002	201.2929 (45)
Distribution loss (46)m = 0.15 x (45)m												1967.9708
Water storage loss:												
Total storage loss	30.6204	26.9436	28.3086	24.1674	22.9299	20.1236	19.4827	20.5664	21.1325	24.2065	26.5200	30.1939 (46)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	255.0950	225.6514	239.6827	210.4314	203.8252	183.4724	180.8435	188.0680	190.1984	212.3358	226.1153	252.2518 (62)
WWHRS	-28.8820	-25.5435	-26.7476	-22.1481	-20.6412	-17.6628	-16.5561	-17.6058	-18.2747	-21.5438	-24.4065	-28.3471 (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	226.2130	200.1080	212.9351	188.2833	183.1839	165.8095	164.2874	170.4623	171.9237	190.7920	201.7088	223.9047 (64)
12Total per year (kWh/year)												2299.6116 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Heat gains from water heating, kWh/month	80.6150	71.2318	75.4904	65.8999	63.5678	56.9361	55.9264	58.3285	59.1725	66.3975	71.1148	79.6696 (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	116.1752	116.1752	116.1752	116.1752	116.1752	116.1752	116.1752	116.1752	116.1752	116.1752	116.1752	116.1752 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	106.3651	117.7613	106.3651	109.9106	106.3651	109.9106	106.3651	106.3651	109.9106	106.3651	109.9106	106.3651 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												

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Cooking gains	204.8733	206.9993	201.6420	190.2369	175.8400	162.3090	153.2695	151.1435	156.5008	167.9059	182.3028	195.8338 (68)
Pumps, fans	34.6175	34.6175	34.6175	34.6175	34.6175	34.6175	34.6175	34.6175	34.6175	34.6175	34.6175	34.6175 (69)
Losses e.g. evaporation	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Water heating gains	-92.9401	-92.9401	-92.9401	-92.9401	-92.9401	-92.9401	-92.9401	-92.9401	-92.9401	-92.9401	-92.9401	-92.9401 (71)
Total internal gains	108.3534	105.9998	101.4656	91.5277	85.4405	79.0779	75.1698	78.3985	82.1840	89.2440	98.7706	107.0828 (72)
	480.4444	491.6129	470.3252	452.5277	428.4982	409.1500	392.6569	393.7596	406.4479	424.3675	451.8365	470.1342 (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				3.6500	11.2829	0.6300	0.7000	0.7700	12.5860 (75)			
Southeast				1.3600	36.7938	0.6300	0.7000	0.7700	15.2928 (77)			
Southwest				7.5900	36.7938	0.6300	0.7000	0.7700	85.3471 (79)			
Solar gains	113.2258	197.0460	280.7112	366.4273	427.4178	431.7996	413.1911	366.5471	310.2157	220.7718	136.3797	96.4051 (83)
Total gains	593.6702	688.6589	751.0364	818.9550	855.9159	840.9496	805.8480	760.3067	716.6636	645.1393	588.2162	566.5393 (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	44.0276	44.1569	44.2844	44.8930	45.0087	45.5554	45.5554	45.6581	45.3432	45.0087	44.7752	44.5336
alpha	3.9352	3.9438	3.9523	3.9929	4.0006	4.0370	4.0370	4.0439	4.0229	4.0006	3.9850	3.9689
util living area	0.9763	0.9577	0.9262	0.8523	0.7282	0.5554	0.4125	0.4529	0.6690	0.8793	0.9584	0.9799 (86)
MIT	19.5228	19.7809	20.1084	20.5119	20.8003	20.9499	20.9881	20.9827	20.8933	20.5196	19.9626	19.4842 (87)
Th 2	20.0125	20.0151	20.0177	20.0297	20.0320	20.0425	20.0425	20.0444	20.0384	20.0320	20.0274	20.0227 (88)
util rest of house	0.9713	0.9490	0.9109	0.8225	0.6771	0.4823	0.3261	0.3637	0.5974	0.8482	0.9483	0.9756 (89)
MIT 2	18.3082	18.6334	19.0413	19.5339	19.8563	20.0094	20.0374	20.0365	19.9601	19.5561	18.8744	18.2665 (90)
Living area fraction	18.6245	18.9322	19.3192	19.7886	20.1021	20.2543	20.2850	20.2829	20.2031	19.8070	19.1578	18.5836 (91)
MIT	18.6245	18.9322	19.3192	19.7886	20.1021	20.2543	20.2850	20.2829	20.2031	19.8070	19.1578	18.5836 (92)
Temperature adjustment	18.6245	18.9322	19.3192	19.7886	20.1021	20.2543	20.2850	20.2829	20.2031	19.8070	19.1578	18.5836 (93)
adjusted MIT	18.6245	18.9322	19.3192	19.7886	20.1021	20.2543	20.2850	20.2829	20.2031	19.8070	19.1578	18.5836 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9617	0.9368	0.8978	0.8142	0.6811	0.4991	0.3483	0.3865	0.6104	0.8398	0.9367	0.9669 (94)
Ext temp.	570.9302	645.1092	674.2493	666.8146	582.9478	419.6795	280.6993	293.8298	437.4772	541.7629	550.9903	547.7786 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Space heating kWh	1139.9512	1113.4226	1014.2462	849.8170	654.0716	434.8841	283.4179	297.9687	471.5979	716.7265	943.5466	1131.6508 (97)
Space heating requirement - total per year (kWh/year)	423.3516	314.7066	252.9577	131.7617	52.9161	0.0000	0.0000	0.0000	0.0000	130.1729	282.6406	434.4009 (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)	423.3516	314.7066	252.9577	131.7617	52.9161	0.0000	0.0000	0.0000	0.0000	130.1729	282.6406	434.4009 (98c)
Space heating requirement after solar 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 (99)
Space heating per m2	(98c) / (4) = 27.5977 (99)											

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)											
Fraction of space heat from main system(s)	1.0000 (202)											
Efficiency of main space heating system 1 (in %)	92.4000 (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
423.3516	314.7066	252.9577	131.7617	52.9161	0.0000	0.0000	0.0000	0.0000	0.0000	130.1729	282.6406	434.4009 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	458.1728	340.5915	273.7637	142.5993	57.2686	0.0000	0.0000	0.0000	0.0000	140.8798	305.8881	470.1308 (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	226.2130	200.1080	212.9351	188.2833	183.1839	165.8095	164.2874	170.4623	171.9237	190.7920	201.7088	223.9047 (64)
Water heating requirement	85.7035	85.3471	84.7515	83.6307	82.0796	80.3000	80.3000	80.3000	80.3000	83.5791	85.1042	85.7755 (216)
Efficiency of water heater (217)m	263.9484	234.4637	251.2464	225.1364	223.1784	206.4876	204.5921	212.2818	214.1017	228.2771	237.0138	261.0357 (219)
Fuel for water heating, kWh/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 (221)
Space cooling fuel requirement (221)m	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.3041	7.3041	7.0685	7.3041 (231)
Pumps and Fa	22.1006	17.7299	15.9638	11.6958	9.0341	7.3810	8.2412	10.7123	13.9142	18.2562	20.6203	22.7148 (232)
Lighting	Electricity generated by PVs (Appendix M) (negative quantity)											

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(233a)m	-34.3412	-48.4410	-69.6733	-78.3987	-84.6009	-78.9988	-78.0291	-73.6349	-65.8847	-55.4231	-37.7660	-29.6875	(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	-19.3216	-40.6568	-80.8259	-121.4182	-160.5636	-161.3275	-159.4221	-134.9688	-98.9151	-58.1434	-25.7981	-15.2777	(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												2189.2945	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2761.7631	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												178.3642	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1811.5181	(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												3403.9037	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2189.2945	0.2100	459.7518 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2761.7631	0.2100	579.9703 (264)
Space and water heating			1039.7221 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	178.3642	0.1443	25.7435 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-734.8793	0.1346	-98.8919
PV Unit electricity exported	-1076.6388	0.1259	-135.5397
Total			-234.4317 (269)
Total CO2, kg/year			842.9632 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.5000 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2189.2945	1.1300	2473.9028 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2761.7631	1.1300	3120.7923 (278)
Space and water heating			5594.6951 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	178.3642	1.5338	273.5809 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-734.8793	1.4973	-1100.3664
PV Unit electricity exported	-1076.6388	0.4621	-497.5239
Total			-1597.8904 (283)
Total Primary energy kWh/year			4400.4865 (286)
Target Primary Energy Rate (TPER)			60.0300 (287)

Predicted Energy Assessment



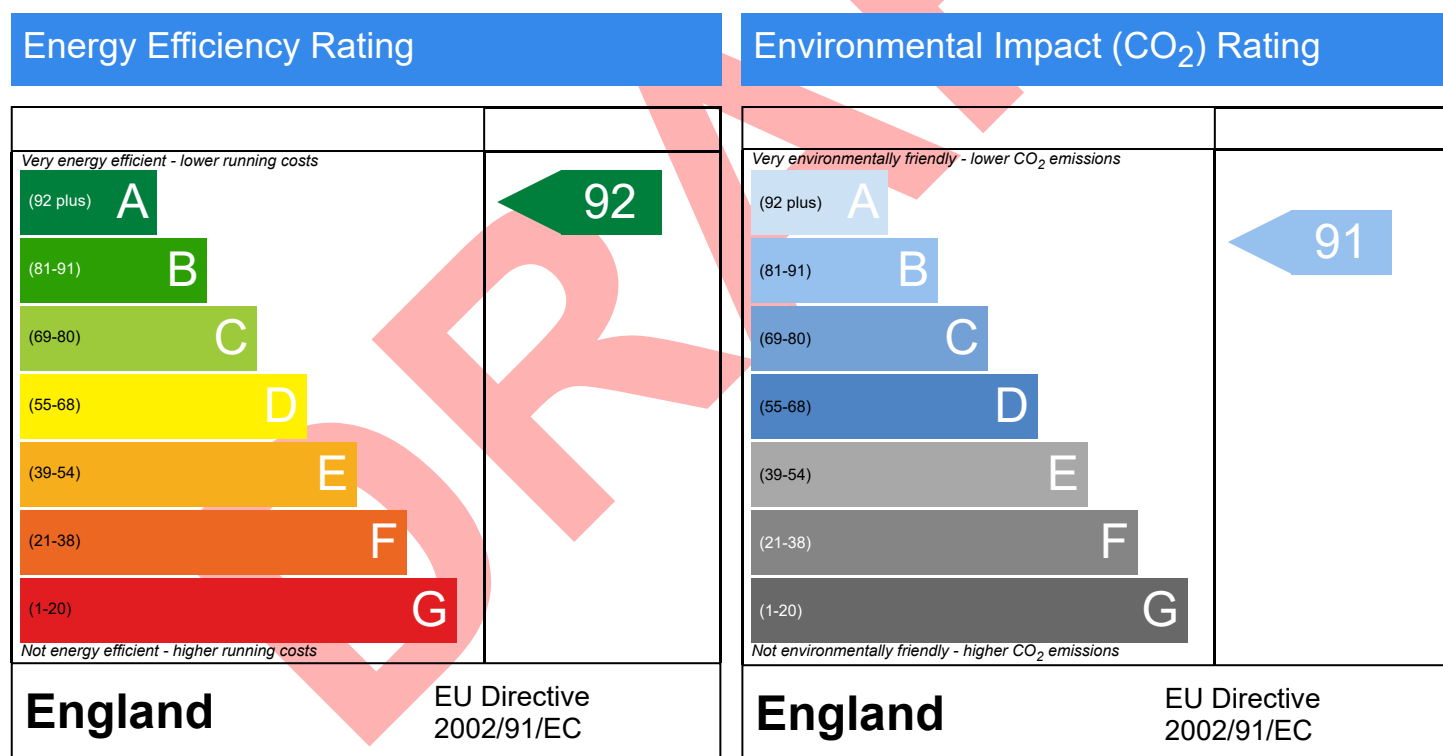
Highmoor Lane, CLECKHEATON, BD19 6LW

Dwelling type:
Date of assessment:
Produced by:
Total floor area:
DRRN:

Flat, Semi-Detached
07/05/2025
Paul Goddard
73.3 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

Energy Report

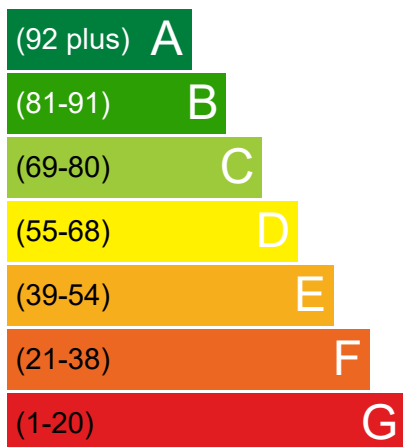
Dwelling Address	Highmoor Lane, CLECKHEATON, BD19 6LW
Reference	APT-01-001
Assessment Date	07/05/2025
Submission Date	
Property Type	Flat, Semi-Detached
Total Floor Area	73

This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

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

Energy Efficiency Rating

Most energy efficient - lower running costs

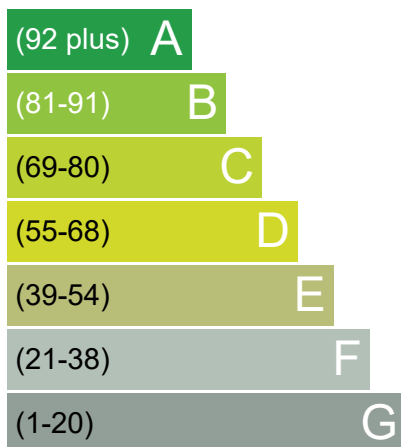


CURRENT POTENTIAL

92 92

Carbon Dioxide (CO2) Emissions Rating

Very environmentally friendly - lower CO2 emissions



CURRENT POTENTIAL

91 91

Additional ratings for your home

	Primary Energy	Energy	Carbon	Cost	HTC
CURRENT	57.68 kWh	3419 kWh	798 kg	224.18 £	73 W/K
POTENTIAL	57.68 kWh	3419 kWh	798 kg	224.18 £	73 W/K

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 0.18 W/m ² K	Very Good
Roof	Average thermal transmittance 0.09 W/m ² K	Very Good
Floor	Average thermal transmittance 0.11 W/m ² K	Very Good
Windows	High performance glazing	Good
Main heating	Boiler and radiators, mains gas	Very Good
Main heating controls	Time and temperature zone control	Very Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 4.0 m ³ /h.m ² (assumed)	Good

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 measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating
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The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

Energy Report

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

		Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting		£62	£62	
Heating		£240	£240	
Hot Water		£138	£138	
New Technologies e.g. Impact of PV		-(£216)	-(£216)	
TOTAL		£224	£224	

Estimated energy use and potential savings



Space Heating

1892

kWh per year



Water Heating

2471

kWh per year

About this document

Created by:

Company/Trading name:

Phone number:

Email address:

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g. heating system) is working correctly.

This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.

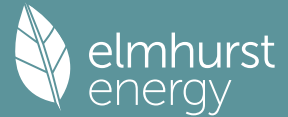
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.

The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Full SAP Calculation Printout



Property Reference	HT06-Mid			Issued on Date	07/05/2025
Assessment Reference	001	Prop Type Ref			
Property	Highmoor Lane, CLECKHEATON, BD19 6LW				
SAP Rating	93 A	DER	10.50	TER	11.26
Environmental	92 A	% DER < TER			6.75
CO ₂ Emissions (t/year)	0.75	DFEE	30.52	TFEE	31.77
Compliance Check	See BREL	% DFEE < TFEE			3.94
% DPER < TPER	5.71	DPER	55.46	TPER	58.82
Assessor Details	Mr. Paul Goddard			Assessor ID	B342-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	36.4200 (1b)	x 2.5000 (2b)	= 91.0500 (1b) - (3b)
First floor	36.4200 (1c)	x 2.6000 (2c)	= 94.6920 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.8400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	185.7420 (5)

2. Ventilation rate

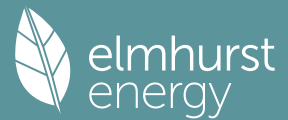
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.2000 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1700 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			2.1600	1.0000	2.1600		(26)
Window			7.6900	1.1450	8.8053		(27)
Patio Door			2.1500	1.3258	2.8504		(27)
GF			36.4200	0.1000	3.6420	9.0000	(28a)
Main	48.3990	12.0000	36.3990	0.1800	6.5518	18.0000	655.1820 (29a)
PIJ	36.4200		36.4200	0.0900	3.2778	9.0000	327.7800 (30)
Total net area of external elements Aum(A, m ²)			121.2390				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.2873		(33)
Main dwelling							
Party Wall 1			76.1800	0.0000	0.0000	20.0000	1523.6000 (32)
Internal Wall 1			151.1500			75.0000	11336.2495 (32c)
Internal Floor 1			36.4200			18.0000	655.5600 (32d)
Internal Ceiling 1			36.4200			9.0000	327.7800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	15153.9315 (34)

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

208.0441 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	8.6300	0.0500	0.4315
E2 Other lintels (including other steel lintels)	8.6300	0.0500	0.4315
E3 Sill	22.1000	0.0500	1.1050
E4 Jamb	9.4900	0.1000	0.9490
E5 Ground floor (normal)	9.4900	0.0700	0.6643
E6 Intermediate floor within a dwelling	20.3800	0.0600	1.2228
E18 Party wall between dwellings	15.3400	0.0800	1.2272
P1 Party wall - Ground floor	15.3400	0.1200	1.8408
P4 Party wall - Roof (insulation at ceiling level)	9.4900	0.0600	0.5694
E10 Eaves (insulation at ceiling level)			

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

8.4415 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 35.7288 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	30.6474	30.6474	30.6474	30.6474	30.6474	30.6474	30.6474	30.6474	30.6474	30.6474	30.6474	30.6474
Heat transfer coeff	66.3763	66.3763	66.3763	66.3763	66.3763	66.3763	66.3763	66.3763	66.3763	66.3763	66.3763	66.3763
Average = Sum(39)m / 12 =												66.3763

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9113	0.9113	0.9113	0.9113	0.9113	0.9113	0.9113	0.9113	0.9113	0.9113	0.9113	0.9113
HLP (average)												0.9113
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3131
Hot water usage for mixer showers												
63.0020	62.0552	60.6755	58.0357	56.0877	53.9152	52.6804	54.0496	55.5505	57.8831	60.5795	62.7606	(42a)
Hot water usage for baths												
27.2161	26.8119	26.2427	25.1932	24.4074	23.5360	23.0653	23.6305	24.2460	25.1784	26.2495	27.1241	(42b)
Hot water usage for other uses												
38.3180	36.9246	35.5312	34.1378	32.7444	31.3511	31.3511	32.7444	34.1378	35.5312	36.9246	38.3180	(42c)
Average daily hot water use (litres/day)												118.1538

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	128.5360	125.7917	122.4494	117.3668	113.2395	108.8023	107.0968	110.4246	113.9343	118.5927	123.7536	128.2027
Energy conte	203.5697	179.1257	188.2002	160.6693	152.4421	133.7851	129.5243	136.7287	140.4924	160.9291	176.3097	200.7344
Energy content (annual)										Total =	Sum(45)m =	1962.5107
Distribution loss (46)m = 0.15 x (45)m												
30.5355	26.8688	28.2300	24.1004	22.8663	20.0678	19.4286	20.5093	21.0739	24.1394	26.4465	30.1102	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Combi loss	1.7065	1.5557	1.7037	1.5443	1.5344	1.4119	1.3913	1.4186	1.4034	1.5251	1.5708	1.6901

Total heat required for water heating calculated for each month												
205.2762	180.6814	189.9039	162.2136	153.9766	135.1970	130.9155	138.1473	141.8958	162.4542	177.8805	202.4245	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	205.2762	180.6814	189.9039	162.2136	153.9766	135.1970	130.9155	138.1473	141.8958	162.4542	177.8805	(64)

12Total per year (kWh/year)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												1980.9665
												1981

Heat gains from water heating, kWh/month

68.1136	59.9482	63.0025	53.8086	51.0706	44.8365	43.4146	45.8169	47.0646	53.8902	59.0157	67.1667	(65)
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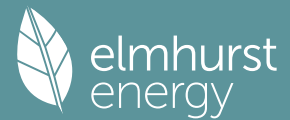
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
111.1614	123.0715	111.1614	114.8668	111.1614	114.8668	111.1614	111.1614	114.8668	111.1614	114.8668	111.1614	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
203.8326	205.9478	200.6177	189.2705	174.9468	161.4845	152.4909	150.3757	155.7058	167.0530	181.3767	194.8390	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	(71)
Water heating gains (Table 5)												
91.5505	89.2086	84.6808	74.7342	68.6433	62.2730	58.3530	61.5819	65.3675	72.4331	81.9662	90.2778	(72)
Total internal gains	467.2403	478.9237	457.1556	439.5673	415.4473	396.3200	379.7010	380.8148	393.6358	411.3432	438.9055	456.9740

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
East	3.8000	19.6403	0.3300	0.0000	0.7700	18.9642
West	3.8900	19.6403	0.3300	0.0000	0.7700	19.4134
West	2.1500	19.6403	0.6300	0.7000	0.7700	12.9050
Solar gains	51.2826	100.3197	165.2123	240.9522	295.2960	302.2880
Total gains	518.5229	579.2434	622.3679	680.5195	710.7433	698.6080
						287.7905
						667.4916
						247.2078
						192.1487
						119.0378
						63.9434
						502.8489
						42.1723
						499.1463

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7. Mean internal temperature (heating season)												
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	63.4176	63.4176	63.4176	63.4176	63.4176	63.4176	63.4176	63.4176	63.4176	63.4176	63.4176	63.4176
alpha	5.2278	5.2278	5.2278	5.2278	5.2278	5.2278	5.2278	5.2278	5.2278	5.2278	5.2278	5.2278
util living area	0.9899	0.9809	0.9613	0.9002	0.7750	0.5896	0.4343	0.4804	0.7218	0.9276	0.9805	0.9917 (86)
MIT	19.9368	20.1060	20.3494	20.6597	20.8813	20.9769	20.9961	20.9935	20.9371	20.6457	20.2326	19.8922 (87)
Th 2	20.1579	20.1579	20.1579	20.1579	20.1579	20.1579	20.1579	20.1579	20.1579	20.1579	20.1579	20.1579 (88)
util rest of house	0.9873	0.9762	0.9515	0.8760	0.7271	0.5191	0.3528	0.3953	0.6531	0.9044	0.9748	0.9896 (89)
MIT 2	18.9187	19.1326	19.4372	19.8115	20.0556	20.1435	20.1564	20.1552	20.1132	19.8032	19.2947	18.8622 (90)
Living area fraction	fLA = Living area / (4) =											0.1922 (91)
MIT	19.1143	19.3197	19.6126	19.9745	20.2143	20.3037	20.3178	20.3163	20.2716	19.9651	19.4750	19.0601 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.9643	19.1697	19.4626	19.8245	20.0643	20.1537	20.1678	20.1663	20.1216	19.8151	19.3250	18.9101 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9823	0.9688	0.9413	0.8648	0.7213	0.5187	0.3538	0.3961	0.6499	0.8929	0.9672	0.9851 (94)
Useful gains	509.3357	561.1924	585.8365	588.5439	512.6495	362.3580	236.1374	248.7692	380.7239	473.5517	486.3394	491.7221 (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	973.3644	947.1695	860.4070	725.1286	555.1901	368.6323	236.8168	249.9924	399.6894	611.6648	811.4504	976.4039 (97)
Space heating kWh	345.2373	259.3766	204.2804	98.3410	31.6502	0.0000	0.0000	0.0000	0.0000	102.7562	234.0799	360.6033 (98a)
Space heating requirement - total per year (kWh/year)												1636.3249
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	345.2373	259.3766	204.2804	98.3410	31.6502	0.0000	0.0000	0.0000	0.0000	102.7562	234.0799	360.6033 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1636.3249
Space heating per m2	(98c) / (4) =											22.4646 (99)
9a. Energy requirements - Individual heating systems, including micro-CHP												
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												88.7000 (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	345.2373	259.3766	204.2804	98.3410	31.6502	0.0000	0.0000	0.0000	0.0000	102.7562	234.0799	360.6033 (98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)
Space heating fuel (main heating system)	389.2191	292.4201	230.3049	110.8692	35.6823	0.0000	0.0000	0.0000	0.0000	115.8469	263.9007	406.5426 (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	205.2762	180.6814	189.9039	162.2136	153.9766	135.1970	130.9155	138.1473	141.8958	162.4542	177.8805	202.4245 (64)
Efficiency of water heater	83.5871	83.1028	82.2035	80.4807	78.0760	76.2000	76.2000	76.2000	76.2000	80.6009	82.8328	76.2000 (216)
Fuel for water heating, kWh/month	245.5835	217.4192	231.0168	201.5559	197.2136	177.4239	171.8052	181.2957	186.2150	201.5538	214.7464	83.7600 (217)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	10.3927	9.3870	10.3927	10.0575	10.3927	10.0575	10.3927	10.3927	10.0575	10.3927	10.0575	10.3927 (231)
Lighting	24.0308	19.2784	17.3581	12.7173	9.8232	8.0256	8.9610	11.6479	15.1295	19.8507	22.4213	24.6987 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-22.5771	-35.5962	-57.5347	-70.7875	-80.0196	-75.8969	-74.6406	-68.3937	-57.3227	-43.1006	-25.8551	-18.9248 (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)	-9.0961	-22.2411	-53.1085	-93.3042	-135.1022	-140.3599	-136.7715	-108.2988	-69.7845	-34.2424	-12.7234	-6.8846 (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												1844.7857 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												76.2000
Water heating fuel used												2467.5010 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(MEVDecentralised, Database: total watage = 4.6540, total flow = 29.0000, SFP = 0.1605)												
mechanical ventilation fans (SFP = 0.1605)												36.3662 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)

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Total electricity for the above, kWh/year	122.3662 (231)
Electricity for lighting (calculated in Appendix L)	193.9426 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1452.5668 (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	3176.0287 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1844.7857	0.2100	387.4050 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2467.5010	0.2100	518.1752 (264)
Space and water heating			905.5802 (265)
Pumps, fans and electric keep-hot	122.3662	0.1432	17.3615 (267)
Energy for lighting	193.9426	0.1490	28.9013 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-630.6495	0.1371	-86.4636
PV Unit electricity exported	-821.9173	0.1222	-100.4476
Total			-186.9111 (269)
Total CO2, kg/year			764.9319 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.5000 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1844.7857	1.1300	2084.6078 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2467.5010	1.1300	2788.2761 (278)
Space and water heating			4872.8839 (279)
Pumps, fans and electric keep-hot	122.3662	1.5335	186.9002 (281)
Energy for lighting	193.9426	1.5547	301.5312 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-630.6495	1.5112	-953.0443
PV Unit electricity exported	-821.9173	0.4484	-368.5650
Total			-1321.6093 (283)
Total Primary energy kWh/year			4039.7060 (286)
Dwelling Primary energy Rate (DPER)			55.4600 (287)

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

1. Overall dwelling characteristics

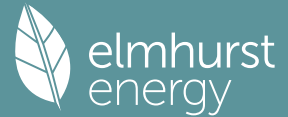
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	36.4200 (1b)	x 2.5000 (2b)	= 91.0500 (1b) - (3b)
First floor	36.4200 (1c)	x 2.6000 (2c)	= 94.6920 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.8400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 185.7420 (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) = 0.1615 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4115 (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) = 0.3498 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)

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Adj infilt rate	0.4460	0.4372	0.4285	0.3848	0.3760	0.3323	0.3323	0.3236	0.3498	0.3760	0.3935	0.4110 (22b)
Effective ac	0.5994	0.5956	0.5918	0.5740	0.5707	0.5552	0.5552	0.5523	0.5612	0.5707	0.5774	0.5845 (25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K					
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K					
TER Opaque door			2.1600	1.0000	2.1600			(26)				
TER Opening Type			9.8400	1.1450	11.2672			(27)				
GF			36.4200	0.1300	4.7346			(28a)				
Main	48.3990	12.0000	36.3990	0.1800	6.5518			(29a)				
PIJ	36.4200		36.4200	0.1100	4.0062			(30)				
Total net area of external elements Aum(A, m2)			121.2390					(31)				
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.7198			(33)				
Main dwelling												
Party Wall 1			76.1800	0.0000	0.0000			(32)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							208.0441	(35)				
List of Thermal Bridges												
K1 Element				Length	Psi-value		Total					
E2 Other lintels (including other steel lintels)				8.6300	0.0500		0.4315					
E3 Sill				8.6300	0.0500		0.4315					
E4 Jamb				22.1000	0.0500		1.1050					
E5 Ground floor (normal)				9.4900	0.1600		1.5184					
E6 Intermediate floor within a dwelling				9.4900	0.0000		0.0000					
E18 Party wall between dwellings				20.3800	0.0600		1.2228					
P1 Party wall - Ground floor				15.3400	0.0800		1.2272					
P4 Party wall - Roof (insulation at ceiling level)				15.3400	0.1200		1.8408					
E10 Eaves (insulation at ceiling level)				9.4900	0.0600		0.5694					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.3466	(36)				
Point Thermal bridges						(36a) =	0.0000					
Total fabric heat loss						(33) + (36) + (36a) =	37.0664	(37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 36.7431	Feb 36.5064	Mar 36.2744	Apr 35.1846	May 34.9807	Jun 34.0316	Jul 34.0316	Aug 33.8558	Sep 34.3972	Oct 34.9807	Nov 35.3932	Dec 35.8244 (38)
Heat transfer coeff	73.8095	73.5728	73.3408	72.2510	72.0471	71.0980	71.0980	70.9222	71.4636	72.0471	72.4596	72.8908 (39)
Average = Sum(39)m / 12 =												72.2500
HLP	Jan 1.0133	Feb 1.0101	Mar 1.0069	Apr 0.9919	May 0.9891	Jun 0.9761	Jul 0.9761	Aug 0.9737	Sep 0.9811	Oct 0.9891	Nov 0.9948	Dec 1.0007 (40)
HLP (average)												0.9919
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

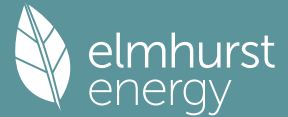
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3131 (42)
Hot water usage for mixer showers												
63.0020	62.0552	60.6755	58.0357	56.0877	53.9152	52.6804	54.0496	55.5505	57.8831	60.5795	62.7606	(42a)
Hot water usage for baths												
27.2161	26.8119	26.2427	25.1932	24.4074	23.5360	23.0653	23.6305	24.2460	25.1784	26.2495	27.1241	(42b)
Hot water usage for other uses												
38.3180	36.9246	35.5312	34.1378	32.7444	31.3511	31.3511	32.7444	34.1378	35.5312	36.9246	38.3180	(42c)
Average daily hot water use (litres/day)												118.1538 (43)
Daily hot water use	Jan 128.5360	Feb 125.7917	Mar 122.4494	Apr 117.3668	May 113.2395	Jun 108.8023	Jul 107.0968	Aug 110.4246	Sep 113.9343	Oct 118.5927	Nov 123.7536	Dec 128.2027 (44)
Energy conte	203.5697	179.1257	188.2002	160.6693	152.4421	133.7851	129.5243	136.7287	140.4924	160.9291	176.3097	200.7344 (45)
Energy content (annual)										Total = Sum(45)m =		1962.5107
Distribution loss (46)m = 0.15 x (45)m												
30.5355	26.8688	28.2300	24.1004	22.8663	20.0678	19.4286	20.5093	21.0739	24.1394	26.4465	30.1102	(46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	(61)
Total heat required for water heating calculated for each month												
254.5286	225.1531	239.1591	209.9844	203.4010	183.1002	180.4832	187.6876	189.8075	211.8880	225.6248	251.6933	(62)
WWHRS	-28.8019	-25.4726	-26.6734	-22.0867	-20.5840	-17.6139	-16.5102	-17.5569	-18.2240	-21.4841	-24.3388	-28.2685 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
225.7267	199.6805	212.4857	187.8977	182.8171	165.4863	163.9730	170.1307	171.5835	190.4040	201.2859	223.4248	(64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2294.8958 (64)
Electric shower(s)												2295 (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												
80.4266	71.0661	75.3163	65.7513	63.4267	56.8123	55.8065	58.2020	59.0425	66.2487	70.9517	79.4839	(65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan 115.6526	Feb 115.6526	Mar 115.6526	Apr 115.6526	May 115.6526	Jun 115.6526	Jul 115.6526	Aug 115.6526	Sep 115.6526	Oct 115.6526	Nov 115.6526	Dec 115.6526 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
111.1614	123.0715	111.1614	114.8668	111.1614	114.8668	111.1614	111.1614	111.1614	114.8668	111.1614	114.8668	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
203.8326	205.9478	200.6177	189.2705	174.9468	161.4845	152.4909	150.3757	155.7058	167.0530	181.3767	194.8390	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	(71)

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Water heating gains (Table 5)	108.1003	105.7532	101.2316	91.3213	85.2510	78.9060	75.0088	78.2285	82.0035	89.0439	98.5441	106.8332 (72)
Total internal gains	483.7901	495.4683	473.7064	456.1543	432.0550	412.9530	396.3568	397.4614	410.2718	427.9540	455.4833	473.5294 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d			Gains W	
East				3.8000	19.6403	0.6300	0.7000	0.7700			22.8088 (76)	
West				6.0400	19.6403	0.6300	0.7000	0.7700			36.2540 (80)	
Solar gains	59.0628	115.5394	190.2770	277.5076	340.0960	348.1488	331.4518	284.7122	221.3000	137.0973	73.6444	48.5704 (83)
Total gains	542.8530	611.0077	663.9834	733.6620	772.1510	761.1018	727.8087	682.1736	631.5718	565.0513	529.1277	522.0998 (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	57.0309	57.2144	57.3954	58.2611	58.4260	59.2060	59.2060	59.3527	58.9031	58.4260	58.0934	57.7497
alpha	4.8021	4.8143	4.8264	4.8841	4.8951	4.9471	4.9471	4.9568	4.9269	4.8951	4.8729	4.8500
util living area	0.9890	0.9796	0.9587	0.8939	0.7666	0.5781	0.4260	0.4717	0.7150	0.9238	0.9789	0.9908 (86)
MIT	19.7846	19.9756	20.2532	20.6166	20.8629	20.9735	20.9951	20.9922	20.9270	20.6008	20.1419	19.7610 (87)
Th 2	20.0723	20.0750	20.0776	20.0901	20.0924	20.1033	20.1033	20.1053	20.0991	20.0924	20.0877	20.0828 (88)
util rest of house	0.9861	0.9744	0.9480	0.8677	0.7159	0.5046	0.3411	0.3831	0.6429	0.8989	0.9726	0.9883 (89)
MIT 2	18.6627	18.9060	19.2552	19.7029	19.9755	20.0870	20.1015	20.1021	20.0479	19.6959	19.1279	18.6404 (90)
Living area fraction	18.8783	19.1116	19.4470	19.8786	20.1460	20.2574	20.2732	20.2732	20.2168	19.8698	19.3228	0.1922 (91)
MIT	18.8783	19.1116	19.4470	19.8786	20.1460	20.2574	20.2732	20.2732	20.2168	19.8698	19.3228	18.8558 (92)
Temperature adjustment	18.8783	19.1116	19.4470	19.8786	20.1460	20.2574	20.2732	20.2732	20.2168	19.8698	19.3228	0.0000 (93)
adjusted MIT	18.8783	19.1116	19.4470	19.8786	20.1460	20.2574	20.2732	20.2732	20.2168	19.8698	19.3228	18.8558 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9811	0.9673	0.9389	0.8607	0.7191	0.5176	0.3574	0.4000	0.6529	0.8916	0.9656	0.9839 (94)
Useful gains	532.5934	591.0062	623.4120	631.4855	555.2332	393.9558	260.1055	272.8786	412.3764	503.8194	510.9344	513.6849 (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	1076.0186	1045.5842	949.5457	793.2114	608.5109	402.2293	261.1596	274.6933	437.1306	667.8654	885.6582	1068.2707 (97)
Space heating kWh	404.3084	305.4764	242.6435	116.4427	39.6386	0.0000	0.0000	0.0000	0.0000	122.0502	269.8011	412.6118 (98a)
Space heating requirement - total per year (kWh/year)												1912.9727
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	404.3084	305.4764	242.6435	116.4427	39.6386	0.0000	0.0000	0.0000	0.0000	122.0502	269.8011	412.6118 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1912.9727
Space heating per m ²										(98c) / (4) =		26.2627 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (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
	404.3084	305.4764	242.6435	116.4427	39.6386	0.0000	0.0000	0.0000	0.0000	122.0502	269.8011	412.6118 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	437.5632	330.6021	262.6011	126.0203	42.8990	0.0000	0.0000	0.0000	0.0000	132.0889	291.9926	446.5496 (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	225.7267	199.6805	212.4857	187.8977	182.8171	165.4863	163.9730	170.1307	171.5835	190.4040	201.2859	223.4248 (64)
Efficiency of water heater	85.6149	85.2893	84.6666	83.3863	81.7084	80.3000	80.3000	80.3000	80.3000	83.4535	85.0099	80.3000 (216)
Fuel for water heating, kWh/month	263.6536	234.1212	250.9675	225.3339	223.7432	206.0851	204.2005	211.8689	213.6781	228.1558	236.7795	260.7765 (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	23.0971	18.5294	16.6837	12.2232	9.4415	7.7138	8.6129	11.1953	14.5416	19.0794	21.5502	23.7391 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	(233a)m	-34.1695	-48.2145	-69.3619	-78.0580	-84.2359	-78.6585	-77.7044	-73.3423	-65.6269	-55.1892	-37.5881
Electricity generated by wind turbines (Appendix M) (negative quantity)	(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)

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Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-19.1566	-40.3242	-80.1928	-120.5049	-159.3900	-160.1595	-158.2567	-133.9524	-98.1387	-57.6645	-25.5771	-15.1449	(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												2070.3168	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2759.3637	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												186.4072	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1800.1497	(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												3301.9380	(238)

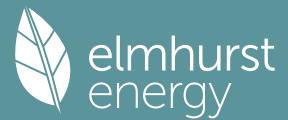
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2070.3168	0.2100	434.7665 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2759.3637	0.2100	579.4664 (264)
Space and water heating			1014.2329 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	186.4072	0.1443	26.9043 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-731.6873	0.1346	-98.4590
PV Unit electricity exported	-1068.4624	0.1259	-134.5017
Total			-232.9608 (269)
Total CO2, kg/year			820.1057 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.2600 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2070.3168	1.1300	2339.4579 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2759.3637	1.1300	3118.0810 (278)
Space and water heating			5457.5389 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	186.4072	1.5338	285.9175 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-731.6873	1.4973	-1095.5743
PV Unit electricity exported	-1068.4624	0.4621	-493.7134
Total			-1589.2877 (283)
Total Primary energy kWh/year			4284.2696 (286)
Target Primary Energy Rate (TPER)			58.8200 (287)

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Property Reference	HT06-Mid			Issued on Date	07/05/2025
Assessment Reference	001	Prop Type Ref			
Property	Highmoor Lane, CLECKHEATON, BD19 6LW				
SAP Rating	93 A	DER	10.50	TER	11.26
Environmental	92 A	% DER < TER			6.75
CO ₂ Emissions (t/year)	0.75	DFEE	30.52	TFEE	31.77
Compliance Check	See BREL	% DFEE < TFEE			3.94
% DPER < TPER	5.71	DPER	55.46	TPER	58.82
Assessor Details	Mr. Paul Goddard			Assessor ID	B342-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	36.4200 (1b)	x 2.5000 (2b)	= 91.0500 (1b) - (3b)
First floor	36.4200 (1c)	x 2.6000 (2c)	= 94.6920 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.8400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 185.7420 (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) =	30.0000 / (5) = 0.1615 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3615 (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) = 0.3073 (21)

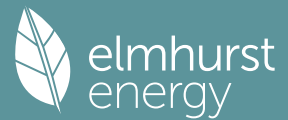
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3918	0.3841	0.3764	0.3380	0.3303	0.2919	0.2919	0.2842	0.3073	0.3303	0.3457	0.3611 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5768	0.5738	0.5708	0.5571	0.5546	0.5426	0.5426	0.5404	0.5472	0.5546	0.5598	0.5652 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			2.1600	1.0000	2.1600		(26)
Window			7.6900	1.1450	8.8053		(27)
Patio Door			2.1500	1.3258	2.8504		(27)
GF			36.4200	0.1000	3.6420	9.0000	327.7800 (28a)
Main	48.3990	12.0000	36.3990	0.1800	6.5518	18.0000	655.1820 (29a)
PIJ	36.4200		36.4200	0.0900	3.2778	9.0000	327.7800 (30)
Total net area of external elements Aum(A, m ²)			121.2390				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	27.2873	(33)
Main dwelling							
Party Wall 1			76.1800	0.0000	0.0000	20.0000	1523.6000 (32)
Internal Wall 1			151.1500			75.0000	11336.2495 (32c)
Internal Floor 1			36.4200			18.0000	655.5600 (32d)
Internal Ceiling 1			36.4200			9.0000	327.7800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	15153.9315 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							208.0441 (35)
List of Thermal Bridges							

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	59.2204	59.3730	59.5233	60.2397	60.3757	61.0168	61.0168	61.1370	60.7682	60.3757	60.1013	59.8171
alpha	4.9480	4.9582	4.9682	5.0160	5.0250	5.0678	5.0678	5.0758	5.0512	5.0250	5.0068	4.9878
util living area	0.9938	0.9877	0.9738	0.9249	0.8154	0.6279	0.4660	0.5160	0.7642	0.9482	0.9874	0.9949 (86)
MIT	19.7330	19.9153	20.1850	20.5567	20.8298	20.9654	20.9936	20.9896	20.9086	20.5477	20.0845	19.7072 (87)
Th 2	20.1035	20.1056	20.1077	20.1174	20.1192	20.1276	20.1276	20.1292	20.1244	20.1192	20.1155	20.1117 (88)
util rest of house	0.9921	0.9844	0.9666	0.9044	0.7694	0.5531	0.3763	0.4230	0.6954	0.9298	0.9834	0.9935 (89)
MIT 2	18.9473	19.1296	19.3966	19.7598	20.0024	20.1105	20.1257	20.1257	20.0725	19.7594	19.3062	18.9281 (90)
Living area fraction												0.1922 (91)
MIT	19.0983	19.2806	19.5481	19.9130	20.1614	20.2748	20.2925	20.2918	20.2332	19.9109	19.4558	19.0779 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0983	19.2806	19.5481	19.9130	20.1614	20.2748	20.2925	20.2918	20.2332	19.9109	19.4558	19.0779 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9896	0.9805	0.9610	0.8989	0.7718	0.5662	0.3935	0.4407	0.7047	0.9245	0.9795	0.9913 (94)
Useful gains	465.6707	522.0885	555.7285	578.0245	522.5758	380.5130	253.3313	265.5040	393.1730	457.5811	451.7364	448.1670 (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	1051.8758	1019.5565	922.7472	769.5637	589.9335	391.4957	254.7390	267.9580	424.8463	649.1602	865.3874	1046.9805 (97)
Space heating kWh	436.1366	334.2985	273.0619	137.9082	50.1142	0.0000	0.0000	0.0000	0.0000	142.5349	297.8287	445.5173 (98a)
Space heating requirement - total per year (kWh/year)												2117.4002
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	436.1366	334.2985	273.0619	137.9082	50.1142	0.0000	0.0000	0.0000	0.0000	142.5349	297.8287	445.5173 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2117.4002
Space heating per m2										(98c) / (4) =		29.0692 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	648.4873	510.5113	523.2779	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8838	0.9379	0.9158	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	573.1364	478.8114	479.2386	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	737.2499	706.5429	660.4723	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	118.1617	169.4322	134.8379	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												fc = cooled area / (4) =
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	29.5404	42.3580	33.7095	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												105.6079 (107)
Energy for space heating												29.0692 (99)
Energy for space cooling												1.4499 (108)
Total												30.5191 (109)
Fabric Energy Efficiency (DFEE)												30.5 (109)

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

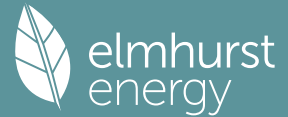
1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	36.4200 (1b)	x 2.5000 (2b)	= 91.0500 (1b) - (3b)
First floor	36.4200 (1c)	x 2.6000 (2c)	= 94.6920 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.8400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	185.7420 (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)

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Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											Air changes per hour	
Pressure test												30.0000 / (5) =	0.1615 (8)
Pressure Test Method												Yes	
Measured/design AP50												Blower Door	
Infiltration rate												5.0000	(17)
Number of sides sheltered												0.4115	(18)
												2	(19)
Shelter factor												(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) =	0.3498 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
	0.4460	0.4372	0.4285	0.3848	0.3760	0.3323	0.3323	0.3236	0.3498	0.3760	0.3935	0.4110	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5994	0.5956	0.5918	0.5740	0.5707	0.5552	0.5552	0.5523	0.5612	0.5707	0.5774	0.5845	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.1600	1.0000	2.1600		(26)
TER Opening Type			9.8400	1.1450	11.2672		(27)
GF			36.4200	0.1300	4.7346		(28a)
Main	48.3990	12.0000	36.3990	0.1800	6.5518		(29a)
PIJ	36.4200		36.4200	0.1100	4.0062		(30)
Total net area of external elements Aum(A, m2)			121.2390				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	28.7198	(33)
Main dwelling							
Party Wall 1			76.1800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							208.0441 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				8.6300	0.0500	0.4315	
E3 Sill				8.6300	0.0500	0.4315	
E4 Jamb				22.1000	0.0500	1.1050	
E5 Ground floor (normal)				9.4900	0.1600	1.5184	
E6 Intermediate floor within a dwelling				9.4900	0.0000	0.0000	
E18 Party wall between dwellings				20.3800	0.0600	1.2228	
P1 Party wall - Ground floor				15.3400	0.0800	1.2272	
P4 Party wall - Roof (insulation at ceiling level)				15.3400	0.1200	1.8408	
E10 Eaves (insulation at ceiling level)				9.4900	0.0600	0.5694	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.3466 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	37.0664 (37)

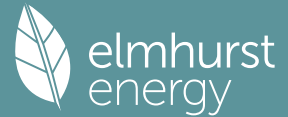
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	36.7431	36.5064	36.2744	35.1846	34.9807	34.0316	34.0316	33.8558	34.3972	34.9807	35.3932	35.8244	(38)
Average = Sum(39)m / 12 =	73.8095	73.5728	73.3408	72.2510	72.0471	71.0980	71.0980	70.9222	71.4636	72.0471	72.4596	72.8908	(39)
												72.2500	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0133	1.0101	1.0069	0.9919	0.9891	0.9761	0.9761	0.9737	0.9811	0.9891	0.9948	1.0007	(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												2.3131	(42)
Hot water usage for mixer showers												0.0000	(42a)
Hot water usage for baths	27.2161	26.8119	26.2427	25.1932	24.4074	23.5360	23.0653	23.6305	24.2460	25.1784	26.2495	27.1241	(42b)
Hot water usage for other uses	38.3180	36.9246	35.5312	34.1378	32.7444	31.3511	31.3511	32.7444	34.1378	35.5312	36.9246	38.3180	(42c)
Average daily hot water use (litres/day)												60.0682	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	65.5341	63.7365	61.7739	59.3311	57.1518	54.8871	54.4164	56.3750	58.3838	60.7096	63.1741	65.4421	(44)
Energy content (annual)	103.7900	90.7600	94.9442	81.2213	76.9374	67.4901	65.8119	69.8040	71.9931	82.3823	90.0030	102.4665	(45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m =	997.6037
Water storage loss:												0.0000	(46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	88.2215	77.1460	80.7026	69.0381	65.3968	57.3666	55.9401	59.3334	61.1941	70.0250	76.5026	87.0965	(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	88.2215	77.1460	80.7026	69.0381	65.3968	57.3666	55.9401	59.3334	61.1941	70.0250	76.5026	87.0965	(64)
12Total per year (kWh/year)												Total per year (kWh/year) = Sum(64)m =	847.9632 (64)
Electric shower(s)	50.4541	44.9550	49.0891	46.8451	47.7242	45.5242	47.0417	47.7242	46.8451	49.0891	48.1661	50.4541	(64a)
												Total Energy used by instantaneous electric shower (s) (kWh/year) = Sum(64a)m =	573.9120 (64a)
Heat gains from water heating, kWh/month	34.6689	30.5252	32.4479	28.9708	28.2802	25.7227	25.7455	26.7644	27.0098	29.7785	31.1672	34.3876	(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	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	111.1614	123.0715	111.1614	114.8668	111.1614	114.8668	111.1614	111.1614	114.8668	111.1614	114.8668	111.1614 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.8326	205.9478	200.6177	189.2705	174.9468	161.4845	152.4909	150.3757	155.7058	167.0530	181.3767	194.8390 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653 (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)	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221 (71)
Water heating gains (Table 5)	46.5980	45.4245	43.6128	40.2372	38.0111	35.7260	34.6041	35.9737	37.5136	40.0249	43.2877	46.2200 (72)
Total internal gains	419.2878	432.1395	413.0877	402.0703	381.8150	369.7730	355.9522	355.2066	365.7820	375.9350	397.2270	409.9161 (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	
East	3.8000		19.6403		0.6300		0.7000		0.7700		22.8088 (76)	
West	6.0400		19.6403		0.6300		0.7000		0.7700		36.2540 (80)	
Solar gains	59.0628	115.5394	190.2770	277.5076	340.0960	348.1488	331.4518	284.7122	221.3000	137.0973	73.6444	48.5704 (83)
Total gains	478.3506	547.6790	603.3646	679.5779	721.9110	717.9218	687.4040	639.9188	587.0820	513.0323	470.8714	458.4865 (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	57.0309	57.2144	57.3954	58.2611	58.4260	59.2060	59.2060	59.3527	58.9031	58.4260	58.0934	57.7497
alpha	4.8021	4.8143	4.8264	4.8841	4.8951	4.9471	4.9471	4.9568	4.9269	4.8951	4.8729	4.8500
util living area	0.9935	0.9867	0.9709	0.9158	0.7980	0.6078	0.4500	0.5008	0.7516	0.9447	0.9867	0.9946 (86)
MIT	19.6769	19.8740	20.1644	20.5579	20.8350	20.9671	20.9938	20.9898	20.9088	20.5353	20.0484	19.6537 (87)
Th 2	20.0723	20.0750	20.0776	20.0901	20.0924	20.1033	20.1033	20.1053	20.0991	20.0924	20.0877	20.0828 (88)
util rest of house	0.9917	0.9832	0.9629	0.8934	0.7494	0.5324	0.3608	0.4077	0.6807	0.9251	0.9826	0.9932 (89)
MIT 2	18.8673	19.0646	19.3519	19.7366	19.9807	20.0873	20.1015	20.1020	20.0479	19.7248	19.2486	18.8525 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.0229	19.2201	19.5081	19.8945	20.1449	20.2564	20.2730	20.2726	20.2134	19.8806	19.4023	19.0065 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.0229	19.2201	19.5081	19.8945	20.1449	20.2564	20.2730	20.2726	20.2134	19.8806	19.4023	19.0065 (93)

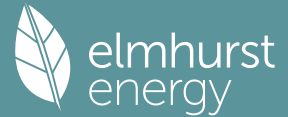
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9890	0.9789	0.9567	0.8878	0.7525	0.5457	0.3779	0.4255	0.6904	0.9195	0.9785	0.9909 (94)
Useful gains	473.0994	536.1502	577.2583	603.3128	543.2332	391.7673	259.7883	272.2727	405.3470	471.7206	460.7248	454.3098 (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	1086.6905	1053.5722	954.0235	794.3633	608.4299	402.1586	261.1413	274.6565	436.8848	668.6411	891.4195	1079.2558 (97)
Space heating kWh	456.5118	347.7076	280.3133	137.5564	48.5063	0.0000	0.0000	0.0000	0.0000	146.5088	310.1002	464.9598 (98a)
Space heating requirement - total per year (kWh/year)												2192.1641
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	456.5118	347.7076	280.3133	137.5564	48.5063	0.0000	0.0000	0.0000	0.0000	146.5088	310.1002	464.9598 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2192.1641
Space heating per m2												(98c) / (4) = 30.0956 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	668.3209	526.1250	539.0087	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8935	0.9432	0.9218	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	597.1398	496.2319	496.8435	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	790.8534	757.5756	704.3086	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	139.4737	194.4397	154.3541	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	34.8684	48.6099	38.5885	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												122.0669 (107)
Energy for space heating												30.0956 (99)
Energy for space cooling												1.6758 (108)
Total												31.7714 (109)
Fabric Energy Efficiency (TFEE)												31.8 (109)

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Property Reference	HT06-Mid			Issued on Date	07/05/2025
Assessment Reference	001	Prop Type Ref			
Property	Highmoor Lane, CLECKHEATON, BD19 6LW				
SAP Rating	93 A	DER	10.50	TER	11.26
Environmental	92 A	% DER < TER			6.75
CO ₂ Emissions (t/year)	0.75	DFEE	30.52	TFEE	31.77
Compliance Check	See BREL	% DFEE < TFEE			3.94
% DPER < TPER	5.71	DPER	55.46	TPER	58.82
Assessor Details	Mr. Paul Goddard			Assessor ID	B342-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	36.4200 (1b)	x 2.5000 (2b)	= 91.0500 (1b) - (3b)
First floor	36.4200 (1c)	x 2.6000 (2c)	= 94.6920 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.8400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 185.7420 (5)

2. Ventilation rate

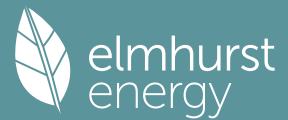
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.2000 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1700 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			2.1600	1.0000	2.1600		(26)
Window			7.6900	1.1450	8.8053		(27)
Patio Door			2.1500	1.3258	2.8504		(27)
GF			36.4200	0.1000	3.6420	9.0000	(28a)
Main	48.3990	12.0000	36.3990	0.1800	6.5518	18.0000	655.1820 (29a)
PIJ	36.4200		36.4200	0.0900	3.2778	9.0000	327.7800 (30)
Total net area of external elements Aum(A, m ²)			121.2390				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.2873		(33)
Main dwelling							
Party Wall 1			76.1800	0.0000	0.0000	20.0000	1523.6000 (32)
Internal Wall 1			151.1500			75.0000	11336.2495 (32c)
Internal Floor 1			36.4200			18.0000	655.5600 (32d)
Internal Ceiling 1			36.4200			9.0000	327.7800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	15153.9315 (34)

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

208.0441 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	8.6300	0.0500	0.4315
E2 Other lintels (including other steel lintels)	8.6300	0.0500	0.4315
E3 Sill	22.1000	0.0500	1.1050
E4 Jamb	9.4900	0.1000	0.9490
E5 Ground floor (normal)	9.4900	0.0700	0.6643
E6 Intermediate floor within a dwelling	20.3800	0.0600	1.2228
E18 Party wall between dwellings	15.3400	0.0800	1.2272
P1 Party wall - Ground floor	15.3400	0.1200	1.8408
P4 Party wall - Roof (insulation at ceiling level)	9.4900	0.0600	0.5694
E10 Eaves (insulation at ceiling level)			

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

8.4415 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 35.7288 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	30.6474	30.6474	30.6474	30.6474	30.6474	30.6474	30.6474	30.6474	30.6474	30.6474	30.6474	30.6474
Heat transfer coeff	66.3763	66.3763	66.3763	66.3763	66.3763	66.3763	66.3763	66.3763	66.3763	66.3763	66.3763	66.3763
Average = Sum(39)m / 12 =												66.3763

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9113	0.9113	0.9113	0.9113	0.9113	0.9113	0.9113	0.9113	0.9113	0.9113	0.9113	0.9113
HLP (average)												0.9113
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy

2.3131 (42)

Hot water usage for mixer showers

63.0020 62.0552 60.6755 58.0357 56.0877 53.9152 52.6804 54.0496 55.5505 57.8831 60.5795 62.7606 (42a)

Hot water usage for baths

27.2161 26.8119 26.2427 25.1932 24.4074 23.5360 23.0653 23.6305 24.2460 25.1784 26.2495 27.1241 (42b)

Hot water usage for other uses

38.3180 36.9246 35.5312 34.1378 32.7444 31.3511 31.3511 32.7444 34.1378 35.5312 36.9246 38.3180 (42c)

Average daily hot water use (litres/day)

30.5355 26.8688 28.2300 24.1004 22.8663 20.0678 19.4286 20.5093 21.0739 24.1394 26.4465 30.1102 (43)

Daily hot water use

128.5360 125.7917 122.4494 117.3668 113.2395 108.8023 107.0968 110.4246 113.9343 118.5927 123.7536 128.2027 (44)

Energy conte

203.5697 179.1257 188.2002 160.6693 152.4421 133.7851 129.5243 136.7287 140.4924 160.9291 176.3097 200.7344 (45)

Energy content (annual)

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

30.5355 26.8688 28.2300 24.1004 22.8663 20.0678 19.4286 20.5093 21.0739 24.1394 26.4465 30.1102 (46)

Water storage loss:

Total storage loss

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (56)

If cylinder contains dedicated solar storage

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (57)

Primary loss

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (59)

Combi loss

1.7065 1.5557 1.7037 1.5443 1.5344 1.4119 1.3913 1.4186 1.4034 1.5251 1.5708 1.6901 (61)

Total heat required for water heating calculated for each month

205.2762 180.6814 189.9039 162.2136 153.9766 135.1970 130.9155 138.1473 141.8958 162.4542 177.8805 202.4245 (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

205.2762 180.6814 189.9039 162.2136 153.9766 135.1970 130.9155 138.1473 141.8958 162.4542 177.8805 202.4245 (64)

12Total per year (kWh/year)

Electric shower(s)

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)

Heat gains from water heating, kWh/month

68.1136 59.9482 63.0025 53.8086 51.0706 44.8365 43.4146 45.8169 47.0646 53.8902 59.0157 67.1667 (65)

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

Metabolic gains (Table 5), Watts

(66)m 115.6526 115.6526 115.6526 115.6526 115.6526 115.6526 115.6526 115.6526 115.6526 115.6526 115.6526 115.6526 (66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

111.1614 123.0715 111.1614 114.8668 111.1614 114.8668 111.1614 111.1614 114.8668 111.1614 114.8668 111.1614 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

203.8326 205.9478 200.6177 189.2705 174.9468 161.4845 152.4909 150.3757 155.7058 167.0530 181.3767 194.8390 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

34.5653 34.5653 34.5653 34.5653 34.5653 34.5653 34.5653 34.5653 34.5653 34.5653 34.5653 34.5653 (69)

Pumps, fans

3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

-92.5221 -92.5221 -92.5221 -92.5221 -92.5221 -92.5221 -92.5221 -92.5221 -92.5221 -92.5221 -92.5221 -92.5221 (71)

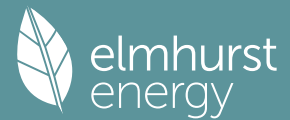
Water heating gains (Table 5)

91.5505 89.2086 84.6808 74.7342 68.6433 62.2730 58.3530 61.5819 65.3675 72.4331 81.9662 90.2778 (72)

Total internal gains

467.2403 478.9237 457.1556 439.5673 415.4473 396.3200 379.7010 380.8148 393.6358 411.3432 438.9055 456.9740 (73)

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7. Mean internal temperature (heating season)												
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	63.4176	63.4176	63.4176	63.4176	63.4176	63.4176	63.4176	63.4176	63.4176	63.4176	63.4176	63.4176
alpha	5.2278	5.2278	5.2278	5.2278	5.2278	5.2278	5.2278	5.2278	5.2278	5.2278	5.2278	5.2278
util living area	0.9899	0.9809	0.9613	0.9002	0.7750	0.5896	0.4343	0.4804	0.7218	0.9276	0.9805	0.9917 (86)
MIT	19.9368	20.1060	20.3494	20.6597	20.8813	20.9769	20.9961	20.9935	20.9371	20.6457	20.2326	19.8922 (87)
Th 2	20.1579	20.1579	20.1579	20.1579	20.1579	20.1579	20.1579	20.1579	20.1579	20.1579	20.1579	20.1579 (88)
util rest of house	0.9873	0.9762	0.9515	0.8760	0.7271	0.5191	0.3528	0.3953	0.6531	0.9044	0.9748	0.9896 (89)
MIT 2	18.9187	19.1326	19.4372	19.8115	20.0556	20.1435	20.1564	20.1552	20.1132	19.8032	19.2947	18.8622 (90)
Living area fraction	fLA = Living area / (4) =											0.1922 (91)
MIT	19.1143	19.3197	19.6126	19.9745	20.2143	20.3037	20.3178	20.3163	20.2716	19.9651	19.4750	19.0601 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.9643	19.1697	19.4626	19.8245	20.0643	20.1537	20.1678	20.1663	20.1216	19.8151	19.3250	18.9101 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9823	0.9688	0.9413	0.8648	0.7213	0.5187	0.3538	0.3961	0.6499	0.8929	0.9672	0.9851 (94)
Useful gains	509.3357	561.1924	585.8365	588.5439	512.6495	362.3580	236.1374	248.7692	380.7239	473.5517	486.3394	491.7221 (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	973.3644	947.1695	860.4070	725.1286	555.1901	368.6323	236.8168	249.9924	399.6894	611.6648	811.4504	976.4039 (97)
Space heating kWh	345.2373	259.3766	204.2804	98.3410	31.6502	0.0000	0.0000	0.0000	0.0000	102.7562	234.0799	360.6033 (98a)
Space heating requirement - total per year (kWh/year)												1636.3249
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	345.2373	259.3766	204.2804	98.3410	31.6502	0.0000	0.0000	0.0000	0.0000	102.7562	234.0799	360.6033 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1636.3249
Space heating per m2	(98c) / (4) =											22.4646 (99)
9a. Energy requirements - Individual heating systems, including micro-CHP												
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												88.7000 (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	345.2373	259.3766	204.2804	98.3410	31.6502	0.0000	0.0000	0.0000	0.0000	102.7562	234.0799	360.6033 (98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)
Space heating fuel (main heating system)	389.2191	292.4201	230.3049	110.8692	35.6823	0.0000	0.0000	0.0000	0.0000	115.8469	263.9007	406.5426 (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	205.2762	180.6814	189.9039	162.2136	153.9766	135.1970	130.9155	138.1473	141.8958	162.4542	177.8805	202.4245 (64)
Efficiency of water heater	83.5871	83.1028	82.2035	80.4807	78.0760	76.2000	76.2000	76.2000	76.2000	80.6009	82.8328	76.2000 (216)
Fuel for water heating, kWh/month	245.5835	217.4192	231.0168	201.5559	197.2136	177.4239	171.8052	181.2957	186.2150	201.5538	214.7464	83.7600 (217)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	10.3927	9.3870	10.3927	10.0575	10.3927	10.0575	10.3927	10.3927	10.0575	10.3927	10.0575	10.3927 (231)
Lighting	24.0308	19.2784	17.3581	12.7173	9.8232	8.0256	8.9610	11.6479	15.1295	19.8507	22.4213	24.6987 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-22.5771	-35.5962	-57.5347	-70.7875	-80.0196	-75.8969	-74.6406	-68.3937	-57.3227	-43.1006	-25.8551	-18.9248 (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)	-9.0961	-22.2411	-53.1085	-93.3042	-135.1022	-140.3599	-136.7715	-108.2988	-69.7845	-34.2424	-12.7234	-6.8846 (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												1844.7857 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												76.2000
Water heating fuel used												2467.5010 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(MEVDecentralised, Database: total watage = 4.6540, total flow = 29.0000, SFP = 0.1605)												
mechanical ventilation fans (SFP = 0.1605)												36.3662 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)

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Total electricity for the above, kWh/year	122.3662 (231)
Electricity for lighting (calculated in Appendix L)	193.9426 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1452.5668 (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	3176.0287 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1844.7857	0.2100	387.4050 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2467.5010	0.2100	518.1752 (264)
Space and water heating			905.5802 (265)
Pumps, fans and electric keep-hot	122.3662	0.1432	17.3615 (267)
Energy for lighting	193.9426	0.1490	28.9013 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-630.6495	0.1371	-86.4636
PV Unit electricity exported	-821.9173	0.1222	-100.4476
Total			-186.9111 (269)
Total CO2, kg/year			764.9319 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.5000 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1844.7857	1.1300	2084.6078 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2467.5010	1.1300	2788.2761 (278)
Space and water heating			4872.8839 (279)
Pumps, fans and electric keep-hot	122.3662	1.5335	186.9002 (281)
Energy for lighting	193.9426	1.5547	301.5312 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-630.6495	1.5112	-953.0443
PV Unit electricity exported	-821.9173	0.4484	-368.5650
Total			-1321.6093 (283)
Total Primary energy kWh/year			4039.7060 (286)
Dwelling Primary energy Rate (DPER)			55.4600 (287)

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

1. Overall dwelling characteristics

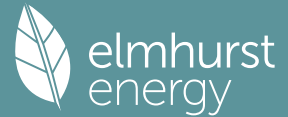
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	36.4200 (1b)	x 2.5000 (2b)	= 91.0500 (1b) - (3b)
First floor	36.4200 (1c)	x 2.6000 (2c)	= 94.6920 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.8400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 185.7420 (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) = 0.1615 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4115 (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) = 0.3498 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)

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Adj infilt rate	0.4460	0.4372	0.4285	0.3848	0.3760	0.3323	0.3323	0.3236	0.3498	0.3760	0.3935	0.4110 (22b)
Effective ac	0.5994	0.5956	0.5918	0.5740	0.5707	0.5552	0.5552	0.5523	0.5612	0.5707	0.5774	0.5845 (25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K					
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K					
TER Opaque door			2.1600	1.0000	2.1600			(26)				
TER Opening Type			9.8400	1.1450	11.2672			(27)				
GF			36.4200	0.1300	4.7346			(28a)				
Main	48.3990	12.0000	36.3990	0.1800	6.5518			(29a)				
PIJ	36.4200		36.4200	0.1100	4.0062			(30)				
Total net area of external elements Aum(A, m2)			121.2390					(31)				
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.7198			(33)				
Main dwelling												
Party Wall 1			76.1800	0.0000	0.0000			(32)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							208.0441	(35)				
List of Thermal Bridges												
K1 Element				Length	Psi-value		Total					
E2 Other lintels (including other steel lintels)				8.6300	0.0500		0.4315					
E3 Sill				8.6300	0.0500		0.4315					
E4 Jamb				22.1000	0.0500		1.1050					
E5 Ground floor (normal)				9.4900	0.1600		1.5184					
E6 Intermediate floor within a dwelling				9.4900	0.0000		0.0000					
E18 Party wall between dwellings				20.3800	0.0600		1.2228					
P1 Party wall - Ground floor				15.3400	0.0800		1.2272					
P4 Party wall - Roof (insulation at ceiling level)				15.3400	0.1200		1.8408					
E10 Eaves (insulation at ceiling level)				9.4900	0.0600		0.5694					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.3466	(36)				
Point Thermal bridges						(36a) =	0.0000					
Total fabric heat loss						(33) + (36) + (36a) =	37.0664	(37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 36.7431	Feb 36.5064	Mar 36.2744	Apr 35.1846	May 34.9807	Jun 34.0316	Jul 34.0316	Aug 33.8558	Sep 34.3972	Oct 34.9807	Nov 35.3932	Dec 35.8244 (38)
Heat transfer coeff	73.8095	73.5728	73.3408	72.2510	72.0471	71.0980	71.0980	70.9222	71.4636	72.0471	72.4596	72.8908 (39)
Average = Sum(39)m / 12 =												72.2500
HLP	Jan 1.0133	Feb 1.0101	Mar 1.0069	Apr 0.9919	May 0.9891	Jun 0.9761	Jul 0.9761	Aug 0.9737	Sep 0.9811	Oct 0.9891	Nov 0.9948	Dec 1.0007 (40)
HLP (average)												0.9919
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

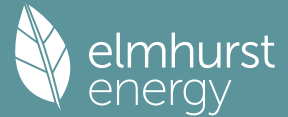
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3131 (42)
Hot water usage for mixer showers												
63.0020	62.0552	60.6755	58.0357	56.0877	53.9152	52.6804	54.0496	55.5505	57.8831	60.5795	62.7606	(42a)
Hot water usage for baths												
27.2161	26.8119	26.2427	25.1932	24.4074	23.5360	23.0653	23.6305	24.2460	25.1784	26.2495	27.1241	(42b)
Hot water usage for other uses												
38.3180	36.9246	35.5312	34.1378	32.7444	31.3511	31.3511	32.7444	34.1378	35.5312	36.9246	38.3180	(42c)
Average daily hot water use (litres/day)												118.1538 (43)
Daily hot water use	Jan 128.5360	Feb 125.7917	Mar 122.4494	Apr 117.3668	May 113.2395	Jun 108.8023	Jul 107.0968	Aug 110.4246	Sep 113.9343	Oct 118.5927	Nov 123.7536	Dec 128.2027 (44)
Energy conte	203.5697	179.1257	188.2002	160.6693	152.4421	133.7851	129.5243	136.7287	140.4924	160.9291	176.3097	200.7344 (45)
Energy content (annual)										Total = Sum(45)m =		1962.5107
Distribution loss (46)m = 0.15 x (45)m												
30.5355	26.8688	28.2300	24.1004	22.8663	20.0678	19.4286	20.5093	21.0739	24.1394	26.4465	30.1102	(46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	(61)
Total heat required for water heating calculated for each month												
254.5286	225.1531	239.1591	209.9844	203.4010	183.1002	180.4832	187.6876	189.8075	211.8880	225.6248	251.6933	(62)
WWHRS	-28.8019	-25.4726	-26.6734	-22.0867	-20.5840	-17.6139	-16.5102	-17.5569	-18.2240	-21.4841	-24.3388	-28.2685 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
225.7267	199.6805	212.4857	187.8977	182.8171	165.4863	163.9730	170.1307	171.5835	190.4040	201.2859	223.4248	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2294.8958 (64)
Electric shower(s)												2295 (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												
80.4266	71.0661	75.3163	65.7513	63.4267	56.8123	55.8065	58.2020	59.0425	66.2487	70.9517	79.4839	(65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan 115.6526	Feb 115.6526	Mar 115.6526	Apr 115.6526	May 115.6526	Jun 115.6526	Jul 115.6526	Aug 115.6526	Sep 115.6526	Oct 115.6526	Nov 115.6526	Dec 115.6526 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
111.1614	123.0715	111.1614	114.8668	111.1614	114.8668	111.1614	111.1614	111.1614	114.8668	111.1614	114.8668	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
203.8326	205.9478	200.6177	189.2705	174.9468	161.4845	152.4909	150.3757	155.7058	167.0530	181.3767	194.8390	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	(71)

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Water heating gains (Table 5)	108.1003	105.7532	101.2316	91.3213	85.2510	78.9060	75.0088	78.2285	82.0035	89.0439	98.5441	106.8332 (72)
Total internal gains	483.7901	495.4683	473.7064	456.1543	432.0550	412.9530	396.3568	397.4614	410.2718	427.9540	455.4833	473.5294 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
East				3.8000	19.6403	0.6300		0.7000		0.7700		22.8088 (76)
West				6.0400	19.6403	0.6300		0.7000		0.7700		36.2540 (80)
Solar gains	59.0628	115.5394	190.2770	277.5076	340.0960	348.1488	331.4518	284.7122	221.3000	137.0973	73.6444	48.5704 (83)
Total gains	542.8530	611.0077	663.9834	733.6620	772.1510	761.1018	727.8087	682.1736	631.5718	565.0513	529.1277	522.0998 (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	57.0309	57.2144	57.3954	58.2611	58.4260	59.2060	59.2060	59.3527	58.9031	58.4260	58.0934	57.7497
alpha	4.8021	4.8143	4.8264	4.8841	4.8951	4.9471	4.9471	4.9568	4.9269	4.8951	4.8729	4.8500
util living area	0.9890	0.9796	0.9587	0.8939	0.7666	0.5781	0.4260	0.4717	0.7150	0.9238	0.9789	0.9908 (86)
MIT	19.7846	19.9756	20.2532	20.6166	20.8629	20.9735	20.9951	20.9922	20.9270	20.6008	20.1419	19.7610 (87)
Th 2	20.0723	20.0750	20.0776	20.0901	20.0924	20.1033	20.1033	20.1053	20.0991	20.0924	20.0877	20.0828 (88)
util rest of house	0.9861	0.9744	0.9480	0.8677	0.7159	0.5046	0.3411	0.3831	0.6429	0.8989	0.9726	0.9883 (89)
MIT 2	18.6627	18.9060	19.2552	19.7029	19.9755	20.0870	20.1015	20.1021	20.0479	19.6959	19.1279	18.6404 (90)
Living area fraction	18.8783	19.1116	19.4470	19.8786	20.1460	20.2574	20.2732	20.2732	20.2168	19.8698	19.3228	0.1922 (91)
MIT	18.8783	19.1116	19.4470	19.8786	20.1460	20.2574	20.2732	20.2732	20.2168	19.8698	19.3228	18.8558 (92)
Temperature adjustment	18.8783	19.1116	19.4470	19.8786	20.1460	20.2574	20.2732	20.2732	20.2168	19.8698	19.3228	0.0000
adjusted MIT	18.8783	19.1116	19.4470	19.8786	20.1460	20.2574	20.2732	20.2732	20.2168	19.8698	19.3228	18.8558 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9811	0.9673	0.9389	0.8607	0.7191	0.5176	0.3574	0.4000	0.6529	0.8916	0.9656	0.9839 (94)
Useful gains	532.5934	591.0062	623.4120	631.4855	555.2332	393.9558	260.1055	272.8786	412.3764	503.8194	510.9344	513.6849 (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	1076.0186	1045.5842	949.5457	793.2114	608.5109	402.2293	261.1596	274.6933	437.1306	667.8654	885.6582	1068.2707 (97)
Space heating kWh	404.3084	305.4764	242.6435	116.4427	39.6386	0.0000	0.0000	0.0000	0.0000	122.0502	269.8011	412.6118 (98a)
Space heating requirement - total per year (kWh/year)												1912.9727
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	404.3084	305.4764	242.6435	116.4427	39.6386	0.0000	0.0000	0.0000	0.0000	122.0502	269.8011	412.6118 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1912.9727
Space heating per m ²										(98c) / (4) =		26.2627 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (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
	404.3084	305.4764	242.6435	116.4427	39.6386	0.0000	0.0000	0.0000	0.0000	122.0502	269.8011	412.6118 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	437.5632	330.6021	262.6011	126.0203	42.8990	0.0000	0.0000	0.0000	0.0000	132.0889	291.9926	446.5496 (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	225.7267	199.6805	212.4857	187.8977	182.8171	165.4863	163.9730	170.1307	171.5835	190.4040	201.2859	223.4248 (64)
Water heating requirement	85.6149	85.2893	84.6666	83.3863	81.7084	80.3000	80.3000	80.3000	80.3000	83.4535	85.0099	85.6767 (217)
Efficiency of water heater	263.6536	234.1212	250.9675	225.3339	223.7432	206.0851	204.2005	211.8689	213.6781	228.1558	236.7795	260.7765 (219)
Fuel for water heating, kWh/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 (221)
Space cooling fuel requirement	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)
(221)m	23.0971	18.5294	16.6837	12.2232	9.4415	7.7138	8.6129	11.1953	14.5416	19.0794	21.5502	23.7391 (232)
Pumps and Fa	-34.1695	-48.2145	-69.3619	-78.0580	-84.2359	-78.6585	-77.7044	-73.3423	-65.6269	-55.1892	-37.5881	-29.5381 (233a)
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 (234a)
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 (235a)
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)
(235c)m												

Full SAP Calculation Printout



Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-19.1566	-40.3242	-80.1928	-120.5049	-159.3900	-160.1595	-158.2567	-133.9524	-98.1387	-57.6645	-25.5771	-15.1449	(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												2070.3168	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2759.3637	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												186.4072	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1800.1497	(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												3301.9380	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2070.3168	0.2100	434.7665 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2759.3637	0.2100	579.4664 (264)
Space and water heating			1014.2329 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	186.4072	0.1443	26.9043 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-731.6873	0.1346	-98.4590
PV Unit electricity exported	-1068.4624	0.1259	-134.5017
Total			-232.9608 (269)
Total CO2, kg/year			820.1057 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.2600 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2070.3168	1.1300	2339.4579 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2759.3637	1.1300	3118.0810 (278)
Space and water heating			5457.5389 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	186.4072	1.5338	285.9175 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-731.6873	1.4973	-1095.5743
PV Unit electricity exported	-1068.4624	0.4621	-493.7134
Total			-1589.2877 (283)
Total Primary energy kWh/year			4284.2696 (286)
Target Primary Energy Rate (TPER)			58.8200 (287)

Predicted Energy Assessment



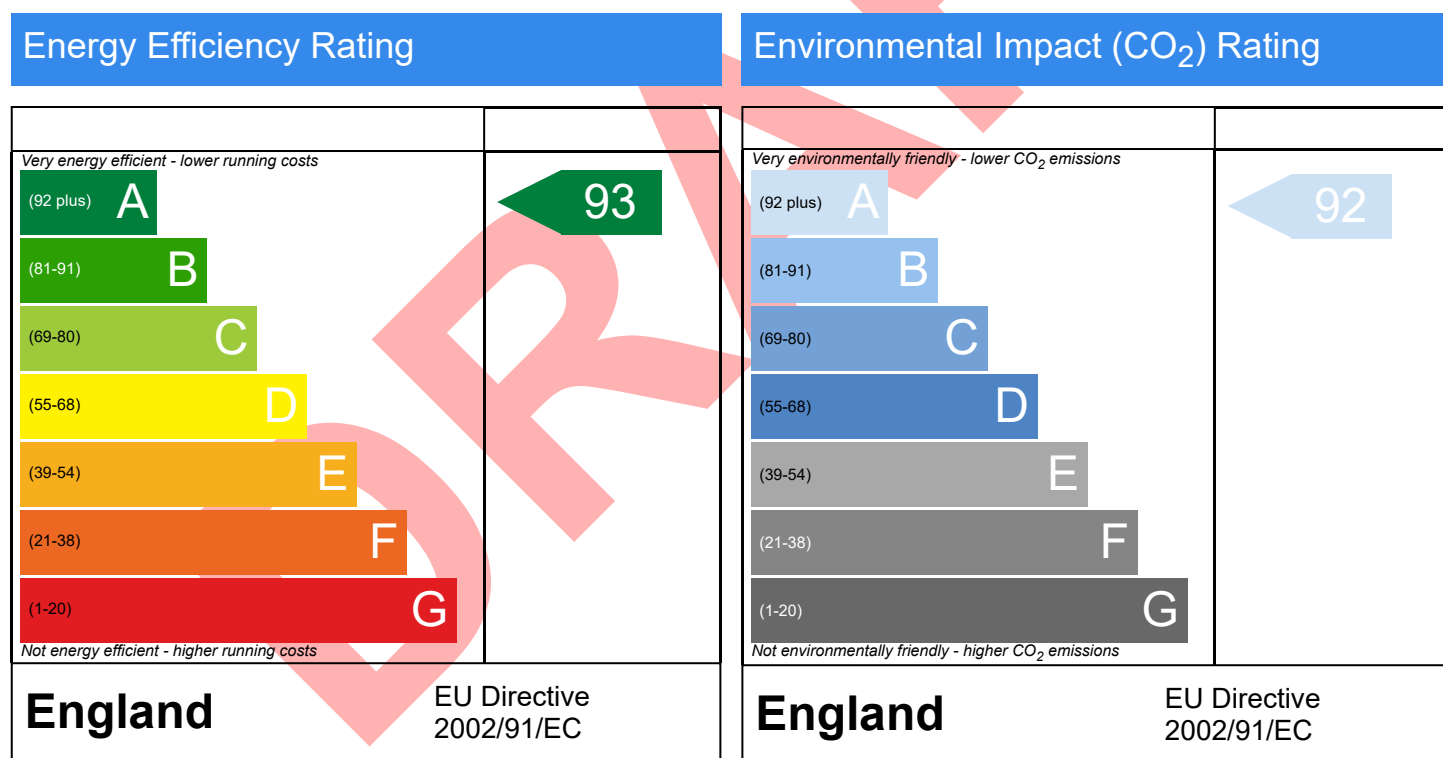
Highmoor Lane, CLECKHEATON, BD19 6LW

Dwelling type:
Date of assessment:
Produced by:
Total floor area:
DRRN:

House, Mid-Terrace
07/05/2025
Paul Goddard
72.84 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

Energy Report



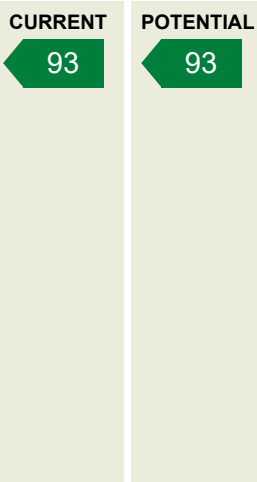
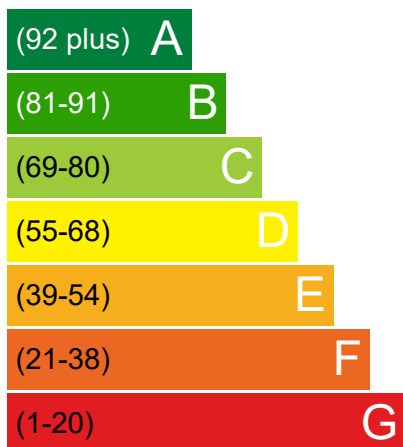
Dwelling Address	Highmoor Lane, CLECKHEATON, BD19 6LW
Reference	HT06-Mid-001
Assessment Date	07/05/2025
Submission Date	
Property Type	House, Mid-Terrace
Total Floor Area	73

This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

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

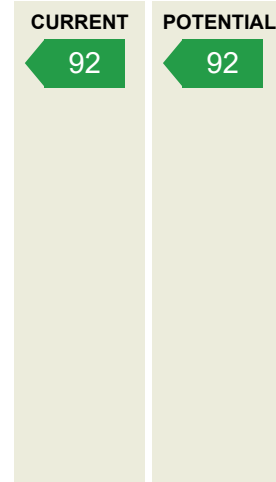
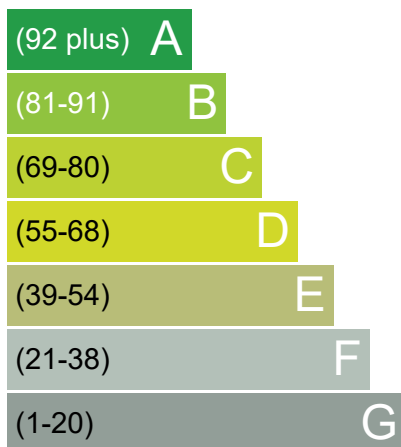
Energy Efficiency Rating

Most energy efficient - lower running costs

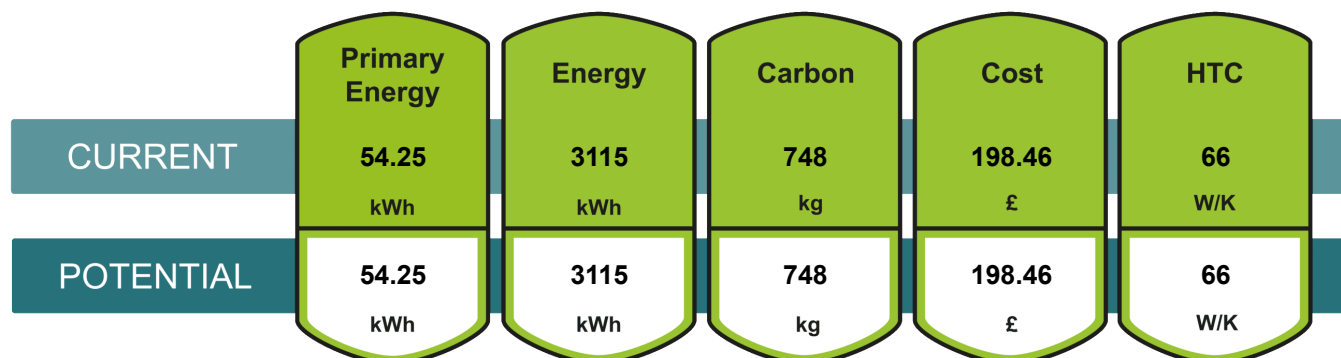


Carbon Dioxide (CO2) Emissions Rating

Very environmentally friendly - lower CO2 emissions



Additional ratings for your home



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 0.18 W/m ² K	Very Good
Roof	Average thermal transmittance 0.09 W/m ² K	Very Good
Floor	Average thermal transmittance 0.1 W/m ² K	Very Good
Windows	High performance glazing	Good
Main heating	Boiler and radiators, mains gas	Very Good
Main heating controls	Time and temperature zone control	Very Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 4.0 m ³ /h.m ² (assumed)	Good

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 measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating
Solar water heating	£18	A 94			A 93

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

		Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting		£57	£57	
Heating		£231	£231	
Hot Water		£138	£138	
New Technologies e.g. Impact of PV		-(£228)	-(£228)	
TOTAL		£198	£198	

Estimated energy use and potential savings



Space Heating

1732

kWh per year



Water Heating

2471

kWh per year

About this document

Created by:
Company/Trading name:
Phone number:
Email address:

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g. heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO ₂)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Full SAP Calculation Printout



Property Reference	HT06-Semi			Issued on Date	07/05/2025
Assessment Reference	001	Prop Type Ref			
Property	Highmoor Lane, CLECKHEATON, BD19 6LW				
SAP Rating	92 A	DER	12.01	TER	12.63
Environmental	90 B	% DER < TER			4.91
CO ₂ Emissions (t/year)	0.86	DFEE	37.50	TFEE	38.28
Compliance Check	See BREL	% DFEE < TFEE			2.03
% DPER < TPER	3.92	DPER	63.54	TPER	66.13
Assessor Details	Mr. Paul Goddard			Assessor ID	B342-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	36.4200 (1b)	x 2.5000 (2b)	= 91.0500 (1b) - (3b)
First floor	36.4200 (1c)	x 2.6000 (2c)	= 94.6920 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.8400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 185.7420 (5)

2. Ventilation rate

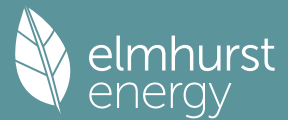
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.2000 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1700 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			2.1600	1.0000	2.1600		(26)
Window			9.1900	1.1450	10.5229		(27)
Patio Door			2.1500	1.3258	2.8504		(27)
GF			36.4200	0.1100	4.0062	9.0000	(28a)
Main	87.5670	13.5000	74.0670	0.1800	13.3321	18.0000	1333.2060 (29a)
PIJ	36.4200		36.4200	0.0900	3.2778	9.0000	327.7800 (30)
Total net area of external elements Aum(A, m ²)			160.4070				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1493		(33)
Main dwelling							
Party Wall 1			39.0800	0.0000	0.0000	20.0000	781.6000 (32)
Internal Wall 1			151.1500			75.0000	11336.2495 (32c)
Internal Floor 1			36.4200			18.0000	655.5600 (32d)
Internal Ceiling 1			36.4200			9.0000	327.7800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	15089.9556 (34)

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

207.1658 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.0000	0.0500	0.5000
E3 Sill	10.0000	0.0500	0.5000
E4 Jamb	26.4900	0.0500	1.3245
E5 Ground floor (normal)	17.1700	0.1000	1.7170
E6 Intermediate floor within a dwelling	17.1700	0.0700	1.2019
E16 Corner (normal)	10.1900	0.0900	0.9171
E18 Party wall between dwellings	10.1900	0.0600	0.6114
P1 Party wall - Ground floor	7.6700	0.0800	0.6136
P4 Party wall - Roof (insulation at ceiling level)	7.6700	0.1200	0.9204
E10 Eaves (insulation at ceiling level)	9.4900	0.0600	0.5694
E12 Gable (insulation at ceiling level)	7.6700	0.0600	0.4602

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

9.3355 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 45.4848 (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	30.6474	30.6474	30.6474	30.6474	30.6474	30.6474	30.6474	30.6474	30.6474	30.6474	30.6474	30.6474
Average = Sum(39)m / 12 =	76.1323	76.1323	76.1323	76.1323	76.1323	76.1323	76.1323	76.1323	76.1323	76.1323	76.1323	76.1323

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0452	1.0452	1.0452	1.0452	1.0452	1.0452	1.0452	1.0452	1.0452	1.0452	1.0452	1.0452
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.3131 (42)											
Hot water usage for mixer showers	62.7606 (42a)											
Hot water usage for baths	27.1241 (42b)											
Hot water usage for other uses	38.3180 (42c)											
Average daily hot water use (litres/day)	118.1538 (43)											
Daily hot water use	128.5360	125.7917	122.4494	117.3668	113.2395	108.8023	107.0968	110.4246	113.9343	118.5927	123.7536	128.2027
Energy conte	203.5697	179.1257	188.2002	160.6693	152.4421	133.7851	129.5243	136.7287	140.4924	160.9291	176.3097	200.7344
Energy content (annual)	Total = Sum(45)m =											1962.5107
Distribution loss (46)m = 0.15 x (45)m	30.5355	26.8688	28.2300	24.1004	22.8663	20.0678	19.4286	20.5093	21.0739	24.1394	26.4465	30.1102
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Combi loss	1.7065	1.5557	1.7037	1.5443	1.5344	1.4119	1.3913	1.4186	1.4034	1.5251	1.5708	1.6901
Total heat required for water heating calculated for each month	205.2762	180.6814	189.9039	162.2136	153.9766	135.1970	130.9155	138.1473	141.8958	162.4542	177.8805	202.4245
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
FV 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
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
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
Output from w/h	205.2762	180.6814	189.9039	162.2136	153.9766	135.1970	130.9155	138.1473	141.8958	162.4542	177.8805	202.4245
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											1980.9665
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
Heat gains from water heating, kWh/month	68.1136	59.9482	63.0025	53.8086	51.0706	44.8365	43.4146	45.8169	47.0646	53.8902	59.0157	67.1667

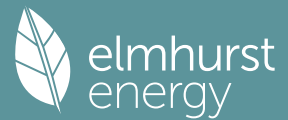
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.8489	119.4041	107.8489	111.4438	107.8489	111.4438	107.8489	107.8489	111.4438	107.8489	111.4438	107.8489
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.8326	205.9478	200.6177	189.2705	174.9468	161.4845	152.4909	150.3757	155.7058	167.0530	181.3767	194.8390
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000
Losses e.g. evaporation (negative values) (Table 5)	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221
Water heating gains (Table 5)	91.5505	89.2086	84.6808	74.7342	68.6433	62.2730	58.3530	61.5819	65.3675	72.4331	81.9662	90.2778
Total internal gains	463.9278	475.2563	453.8431	436.1443	412.1348	392.8971	376.3885	377.5023	390.2129	408.0307	435.4825	453.6615

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	1.5000	10.6334	0.3300	0.0000	0.7700	4.0529 (74)
East	3.8000	19.6403	0.3300	0.0000	0.7700	18.9642 (76)
West	3.8900	19.6403	0.3300	0.0000	0.7700	19.4134 (80)
West	2.1500	19.6403	0.6300	0.7000	0.7700	12.9050 (80)

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Solar gains	55.3355	108.0650	178.3735	262.0925	323.7739	332.7745	316.2535	269.7896	207.9728	128.2576	68.9432	45.5511 (83)
Total gains	519.2633	583.3213	632.2166	698.2369	735.9087	725.6715	692.6420	647.2919	598.1857	536.2883	504.4257	499.2125 (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	55.0575	55.0575	55.0575	55.0575	55.0575	55.0575	55.0575	55.0575	55.0575	55.0575	55.0575	55.0575
alpha	4.6705	4.6705	4.6705	4.6705	4.6705	4.6705	4.6705	4.6705	4.6705	4.6705	4.6705	4.6705
util living area	0.9909	0.9834	0.9670	0.9163	0.8074	0.6331	0.4751	0.5265	0.7663	0.9413	0.9833	0.9924 (86)
MIT	19.6825	19.8649	20.1426	20.5101	20.8018	20.9516	20.9897	20.9836	20.8835	20.5004	20.0213	19.6360 (87)
Th 2	20.0458	20.0458	20.0458	20.0458	20.0458	20.0458	20.0458	20.0458	20.0458	20.0458	20.0458	20.0458 (88)
util rest of house	0.9885	0.9791	0.9580	0.8935	0.7583	0.5526	0.3762	0.4241	0.6937	0.9203	0.9781	0.9904 (89)
MIT 2	18.5148	18.7459	19.0952	19.5440	19.8731	20.0155	20.0419	20.0390	19.9616	19.5420	18.9465	18.4556 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.7392	18.9610	19.2965	19.7297	20.0516	20.1954	20.2241	20.2206	20.1388	19.7262	19.1530	18.6825 (92)
Temperature adjustment												
adjusted MIT	18.5892	18.8110	19.1465	19.5797	19.9016	20.0454	20.0741	20.0706	19.9888	19.5762	19.0030	18.5325 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9832	0.9713	0.9470	0.8801	0.7500	0.5526	0.3792	0.4268	0.6888	0.9071	0.9702	0.9858 (94)
Useful gains	510.5515	566.5863	598.6899	614.4876	551.9455	400.9979	262.6592	276.2795	412.0476	486.4727	489.3873	492.1047 (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	1087.8704	1059.0764	962.8075	813.0663	624.4062	414.5723	264.4899	279.4476	448.3263	683.3777	906.2060	1091.1656 (97)
Space heating kWh	429.5253	330.9534	270.9035	142.9766	53.9107	0.0000	0.0000	0.0000	0.0000	146.4974	300.1095	445.7013 (98a)
Space heating requirement - total per year (kWh/year)	2120.5777											
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	429.5253	330.9534	270.9035	142.9766	53.9107	0.0000	0.0000	0.0000	0.0000	146.4974	300.1095	445.7013 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2120.5777											
Space heating per m2	(98c) / (4) = 29.1128 (99)											

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)											
Fraction of space heat from main system(s)	1.0000 (202)											
Efficiency of main space heating system 1 (in %)	88.7000 (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	429.5253	330.9534	270.9035	142.9766	53.9107	0.0000	0.0000	0.0000	0.0000	146.4974	300.1095	445.7013 (98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)
Space heating fuel (main heating system)	484.2450	373.1154	305.4155	161.1913	60.7787	0.0000	0.0000	0.0000	0.0000	165.1605	338.3421	502.4818 (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	205.2762	180.6814	189.9039	162.2136	153.9766	135.1970	130.9155	138.1473	141.8958	162.4542	177.8805	202.4245 (64)
Efficiency of water heater	84.2318	83.8429	83.0833	81.5864	79.0904	76.2000	76.2000	76.2000	76.2000	81.6565	83.5967	76.2000 (216)
Fuel for water heating, kWh/month	243.7039	215.4998	228.5705	198.8243	194.6843	177.4239	171.8052	181.2957	186.2150	198.9482	212.7841	239.9048 (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	10.3927	9.3870	10.3927	10.0575	10.3927	10.0575	10.3927	10.3927	10.0575	10.3927	10.0575	10.3927 (231)
Lighting	23.3147	18.7039	16.8408	12.3383	9.5305	7.7865	8.6940	11.3008	14.6786	19.2592	21.7532	23.9627 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-22.5671	-35.5759	-57.4975	-70.7400	-79.9685	-75.8502	-74.5891	-68.3378	-57.2724	-43.0679	-25.8406	-18.9166 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-9.1062	-22.2614	-53.1457	-93.3517	-135.1533	-140.4066	-136.8231	-108.3547	-69.8348	-34.2752	-12.7379	-6.8929 (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	2390.7303 (211)											
Space heating fuel - main system 2	0.0000 (213)											
Space heating fuel - secondary	0.0000 (215)											
Efficiency of water heater	76.2000											
Water heating fuel used	2449.6598 (219)											
Space cooling fuel	0.0000 (221)											

Electricity for pumps and fans:
(MEVDcentralised, Database: total watage = 4.6540, total flow = 29.0000, SFP = 0.1605)

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mechanical ventilation fans (SFP = 0.1605)	36.3662 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	122.3662 (231)
Electricity for lighting (calculated in Appendix L)	188.1633 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1452.5668 (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	3698.3528 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2390.7303	0.2100	502.0534 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2449.6598	0.2100	514.4286 (264)
Space and water heating			1016.4819 (265)
Pumps, fans and electric keep-hot	122.3662	0.1432	17.3615 (267)
Energy for lighting	188.1633	0.1490	28.0400 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-630.2235	0.1371	-86.4059
PV Unit electricity exported	-822.3433	0.1222	-100.5028
Total			-186.9087 (269)
Total CO2, kg/year			874.9748 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.0100 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2390.7303	1.1300	2701.5252 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2449.6598	1.1300	2768.1155 (278)
Space and water heating			5469.6407 (279)
Pumps, fans and electric keep-hot	122.3662	1.5335	186.9002 (281)
Energy for lighting	188.1633	1.5547	292.5458 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-630.2235	1.5112	-952.4034
PV Unit electricity exported	-822.3433	0.4484	-368.7677
Total			-1321.1711 (283)
Total Primary energy kWh/year			4627.9156 (286)
Dwelling Primary energy Rate (DPER)			63.5400 (287)

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

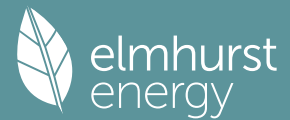
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	36.4200 (1b)	x 2.5000 (2b)	= 91.0500 (1b) - (3b)
First floor	36.4200 (1c)	x 2.6000 (2c)	= 94.6920 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.8400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	185.7420 (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) = 0.1615 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4115 (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) = 0.3498 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4460	0.4372	0.4285	0.3848	0.3760	0.3323	0.3323	0.3236	0.3498	0.3760	0.3935	0.4110 (22b)
	0.5994	0.5956	0.5918	0.5740	0.5707	0.5552	0.5552	0.5523	0.5612	0.5707	0.5774	0.5845 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.1600	1.0000	2.1600		(26)
TER Opening Type			11.3400	1.1450	12.9847		(27)
GF			36.4200	0.1300	4.7346		(28a)
Main	87.5670	13.5000	74.0670	0.1800	13.3321		(29a)
PIJ	36.4200		36.4200	0.1100	4.0062		(30)
Total net area of external elements Aum(A, m2)			160.4070				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.2176		(33)
Main dwelling							
Party Wall 1			39.0800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							207.1658 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				10.0000	0.0500	0.5000	
E3 Sill				10.0000	0.0500	0.5000	
E4 Jamb				26.4900	0.0500	1.3245	
E5 Ground floor (normal)				17.1700	0.1600	2.7472	
E6 Intermediate floor within a dwelling				17.1700	0.0000	0.0000	
E16 Corner (normal)				10.1900	0.0900	0.9171	
E18 Party wall between dwellings				10.1900	0.0600	0.6114	
P1 Party wall - Ground floor				7.6700	0.0800	0.6136	
P4 Party wall - Roof (insulation at ceiling level)				7.6700	0.1200	0.9204	
E10 Eaves (insulation at ceiling level)				9.4900	0.0600	0.5694	
E12 Gable (insulation at ceiling level)				7.6700	0.0600	0.4602	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.1638 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	46.3814 (37)

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

(38)m	Jan 36.7431	Feb 36.5064	Mar 36.2744	Apr 35.1846	May 34.9807	Jun 34.0316	Jul 34.0316	Aug 33.8558	Sep 34.3972	Oct 34.9807	Nov 35.3932	Dec 35.8244 (38)
Heat transfer coeff	83.1245	82.8878	82.6558	81.5660	81.3621	80.4130	80.4130	80.2372	80.7786	81.3621	81.7746	82.2058 (39)
Average = Sum(39)m / 12 =												81.5650
HLP	Jan 1.1412	Feb 1.1379	Mar 1.1348	Apr 1.1198	May 1.1170	Jun 1.1040	Jul 1.1040	Aug 1.1016	Sep 1.1090	Oct 1.1170	Nov 1.1227	Dec 1.1286 (40)
HLP (average)												1.1198
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

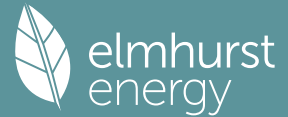
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3131 (42)
Hot water usage for mixer showers												
63.0020	62.0552	60.6755	58.0357	56.0877	53.9152	52.6804	54.0496	55.5505	57.8831	60.5795	62.7606 (42a)	
Hot water usage for baths												
27.2161	26.8119	26.2427	25.1932	24.4074	23.5360	23.0653	23.6305	24.2460	25.1784	26.2495	27.1241 (42b)	
Hot water usage for other uses												
38.3180	36.9246	35.5312	34.1378	32.7444	31.3511	31.3511	32.7444	34.1378	35.5312	36.9246	38.3180 (42c)	
Average daily hot water use (litres/day)												118.1538 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
128.5360	125.7917	122.4494	117.3668	113.2395	108.8023	107.0968	110.4246	113.9343	118.5927	123.7536	128.2027 (44)	
Energy content (annual)	203.5697	179.1257	188.2002	160.6693	152.4421	133.7851	129.5243	136.7287	140.4924	160.9291	176.3097	200.7344 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1962.5107
30.5355	26.8688	28.2300	24.1004	22.8663	20.0678	19.4286	20.5093	21.0739	24.1394	26.4465	30.1102 (46)	
Water storage loss:												
Total storage loss												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)	
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)	
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
254.5286	225.1531	239.1591	209.9844	203.4010	183.1002	180.4832	187.6876	189.8075	211.8880	225.6248	251.6933 (62)	
WWHRS	-28.8019	-25.4726	-26.6734	-22.0867	-20.5840	-17.6139	-16.5102	-17.5569	-18.2240	-21.4841	-24.3388	-28.2685 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)	
Output from w/h	225.7267	199.6805	212.4857	187.8977	182.8171	165.4863	163.9730	170.1307	171.5835	190.4040	201.2859	223.4248 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2294.8958 (64)
Electric shower(s)												2295 (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)	
Heat gains from water heating, kWh/month	80.4266	71.0661	75.3163	65.7513	63.4267	56.8123	55.8065	58.2020	59.0425	66.2487	70.9517	79.4839 (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	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	107.8489	119.4041	107.8489	111.4438	107.8489	111.4438	107.8489	107.8489	111.4438	107.8489	111.4438	107.8489 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	203.8326	205.9478	200.6177	189.2705	174.9468	161.4845	152.4909	150.3757	155.7058	167.0530	181.3767	194.8390 (68)

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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653 (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)	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221 (71)
Water heating gains (Table 5)	108.1003	105.7532	101.2316	91.3213	85.2510	78.9060	75.0088	78.2285	82.0035	89.0439	98.5441	106.8332 (72)
Total internal gains	480.4776	491.8008	470.3939	452.7314	428.7425	409.5301	393.0443	394.1489	406.8489	424.6415	452.0604	470.2169 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				1.5000	10.6334	0.6300	0.7000	0.7700	4.8746 (74)			
East				3.8000	19.6403	0.6300	0.7000	0.7700	22.8088 (76)			
West				6.0400	19.6403	0.6300	0.7000	0.7700	36.2540 (80)			
Solar gains	63.9374	124.8549	206.1063	302.9336	374.3471	384.8156	365.6850	311.8719	240.3320	148.1862	79.6578	52.6341 (83)
Total gains	544.4150	616.6558	676.5002	755.6650	803.0896	794.3458	758.7294	706.0208	647.1809	572.8277	531.7182	522.8509 (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	50.4262	50.5702	50.7122	51.3897	51.5185	52.1266	52.1266	52.2408	51.8907	51.5185	51.2586	50.9898
alpha	4.3617	4.3713	4.3808	4.4260	4.4346	4.4751	4.4751	4.4827	4.4594	4.4346	4.4172	4.3993
util living area	0.9897	0.9813	0.9627	0.9061	0.7909	0.6118	0.4580	0.5088	0.7511	0.9349	0.9811	0.9913 (86)
MIT	19.5515	19.7553	20.0655	20.4822	20.7917	20.9508	20.9892	20.9830	20.8777	20.4676	19.9471	19.5247 (87)
Th 2	19.9673	19.9700	19.9725	19.9847	19.9870	19.9976	19.9976	19.9996	19.9935	19.9870	19.9824	19.9776 (88)
util rest of house	0.9869	0.9763	0.9525	0.8807	0.7384	0.5292	0.3577	0.4046	0.6748	0.9117	0.9752	0.9890 (89)
MIT 2	18.2931	18.5530	18.9444	19.4601	19.8084	19.9674	19.9936	19.9927	19.9068	19.4558	18.8072	18.2662 (90)
Living area fraction												0.1922 (91)
MIT	18.5350	18.7841	19.1599	19.6566	19.9974	20.1564	20.1849	20.1830	20.0934	19.6502	19.0263	18.5081 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5350	18.7841	19.1599	19.6566	19.9974	20.1564	20.1849	20.1830	20.0934	19.6502	19.0263	18.5081 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9814	0.9685	0.9422	0.8710	0.7390	0.5429	0.3768	0.4243	0.6831	0.9021	0.9676	0.9841 (94)
Useful gains	534.3114	597.2595	637.3756	658.1843	593.5147	431.2555	285.9117	299.5653	442.0870	516.7239	514.4850	514.5428 (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	1183.2763	1150.8205	1046.4110	877.3696	675.0909	446.8101	288.2755	303.5374	484.1354	736.3468	975.2678	1176.2103 (97)
Space heating kWh	482.8299	371.9930	304.3223	157.8134	60.6927	0.0000	0.0000	0.0000	0.0000	163.3995	331.7636	492.2806 (98a)
Space heating requirement - total per year (kWh/year)												2365.0951
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	482.8299	371.9930	304.3223	157.8134	60.6927	0.0000	0.0000	0.0000	0.0000	163.3995	331.7636	492.2806 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2365.0951
Space heating per m2										(98c) / (4) =		32.4697 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (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
	482.8299	371.9930	304.3223	157.8134	60.6927	0.0000	0.0000	0.0000	0.0000	163.3995	331.7636	492.2806 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	522.5432	402.5899	329.3532	170.7938	65.6847	0.0000	0.0000	0.0000	0.0000	176.8392	359.0515	532.7712 (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	225.7267	199.6805	212.4857	187.8977	182.8171	165.4863	163.9730	170.1307	171.5835	190.4040	201.2859	223.4248 (64)
Efficiency of water heater (217)m	85.9669	85.6943	85.1505	84.0099	82.2840	80.3000	80.3000	80.3000	80.3000	84.0554	85.4445	80.3000 (216)
Fuel for water heating, kWh/month	262.5739	233.0149	249.5412	223.6615	222.1783	206.0851	204.2005	211.8689	213.6781	226.5221	235.5751	259.7240 (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	22.4089	17.9772	16.1865	11.8589	9.1602	7.4839	8.3562	10.8617	14.1083	18.5109	20.9080	23.0317 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-34.1499	-48.1810	-69.3106	-78.0013	-84.1795	-78.6084	-77.6485	-73.2781	-65.5622	-55.1391	-37.5614	-29.5213 (233a)

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Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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	-19.1761	-40.3577	-80.2442	-120.5616	-159.4464	-160.2096	-158.3126	-134.0165	-98.2034	-57.7147	-25.6038	-15.1616	(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												2559.6267	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2748.6235	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												180.8524	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1800.1497	(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												3774.9530	(238)

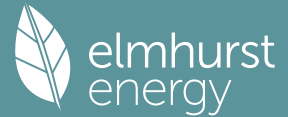
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2559.6267	0.2100	537.5216	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2748.6235	0.2100	577.2109	(264)
Space and water heating			1114.7326	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	180.8524	0.1443	26.1026	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.1414	0.1346	-98.3862	
PV Unit electricity exported	-1069.0083	0.1259	-134.5751	
Total			-232.9613	(269)
Total CO2, kg/year			919.8031	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.6300	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2559.6267	1.1300	2892.3782	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2748.6235	1.1300	3105.9446	(278)
Space and water heating			5998.3228	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	180.8524	1.5338	277.3974	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.1414	1.4973	-1094.7592	
PV Unit electricity exported	-1069.0083	0.4621	-493.9831	
Total			-1588.7422	(283)
Total Primary energy kWh/year			4817.0788	(286)
Target Primary Energy Rate (TPER)			66.1300	(287)

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Property Reference	HT06-Semi			Issued on Date	07/05/2025
Assessment Reference	001	Prop Type Ref			
Property	Highmoor Lane, CLECKHEATON, BD19 6LW				
SAP Rating	92 A	DER	12.01	TER	12.63
Environmental	90 B	% DER < TER			4.91
CO ₂ Emissions (t/year)	0.86	DFEE	37.50	TFEE	38.28
Compliance Check	See BREL	% DFEE < TFEE			2.03
% DPER < TPER	3.92	DPER	63.54	TPER	66.13
Assessor Details	Mr. Paul Goddard			Assessor ID	B342-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	36.4200 (1b)	x 2.5000 (2b)	= 91.0500 (1b) - (3b)
First floor	36.4200 (1c)	x 2.6000 (2c)	= 94.6920 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.8400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 185.7420 (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) =	30.0000 / (5) = 0.1615 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3615 (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) = 0.3073 (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	0.3918	0.3841	0.3764	0.3380	0.3303	0.2919	0.2919	0.2842	0.3073	0.3303	0.3457	0.3611 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5768	0.5738	0.5708	0.5571	0.5546	0.5426	0.5426	0.5404	0.5472	0.5546	0.5598	0.5652 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			2.1600	1.0000	2.1600		(26)
Window			9.1900	1.1450	10.5229		(27)
Patio Door			2.1500	1.3258	2.8504		(27)
GF			36.4200	0.1100	4.0062	9.0000	327.7800 (28a)
Main	87.5670	13.5000	74.0670	0.1800	13.3321	18.0000	1333.2060 (29a)
PIJ	36.4200		36.4200	0.0900	3.2778	9.0000	327.7800 (30)
Total net area of external elements Aum(A, m ²)			160.4070				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 36.1493		(33)
Main dwelling							
Party Wall 1			39.0800	0.0000	0.0000	20.0000	781.6000 (32)
Internal Wall 1			151.1500			75.0000	11336.2495 (32c)
Internal Floor 1			36.4200			18.0000	655.5600 (32d)
Internal Ceiling 1			36.4200			9.0000	327.7800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	15089.9556 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							207.1658 (35)
List of Thermal Bridges							

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Total gains 471.3108 536.5372 588.1486 660.7399 702.2764 699.1246 668.8932 621.6836 570.3318 500.8801 462.7473 452.1547 (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	51.8534	51.9708	52.0865	52.6366	52.7408	53.2314	53.2314	53.3233	53.0413	52.7408	52.5304	52.3122
alpha	4.4569	4.4647	4.4724	4.5091	4.5161	4.5488	4.5488	4.5549	4.5361	4.5161	4.5020	4.4875
util living area	0.9940	0.9886	0.9763	0.9345	0.8390	0.6666	0.5051	0.5600	0.8005	0.9562	0.9885	0.9950 (86)
MIT	19.4867	19.6806	19.9814	20.4037	20.7416	20.9345	20.9851	20.9767	20.8469	20.4008	19.8777	19.4582 (87)
Th 2	19.9929	19.9949	19.9969	20.0063	20.0081	20.0163	20.0163	20.0179	20.0132	20.0081	20.0045	20.0008 (88)
util rest of house	0.9923	0.9854	0.9694	0.9150	0.7926	0.5832	0.3983	0.4503	0.7296	0.9393	0.9848	0.9936 (89)
MIT 2	18.6180	18.8118	19.1101	19.5242	19.8294	19.9839	20.0119	20.0102	19.9248	19.5302	19.0161	18.5956 (90)
Living area fraction	18.6180	18.8118	19.1101	19.5242	19.8294	19.9839	20.0119	20.0102	19.9248	19.5302	19.0161	18.5956 (90)
MIT	18.7849	18.9788	19.2776	19.6933	20.0047	20.1666	20.1990	20.1960	20.1021	19.6976	19.1817	18.7614 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7849	18.9788	19.2776	19.6933	20.0047	20.1666	20.1990	20.1960	20.1021	19.6976	19.1817	18.7614 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9896	0.9811	0.9631	0.9077	0.7924	0.5967	0.4187	0.4710	0.7368	0.9325	0.9806	0.9913 (94)
Useful gains	466.3991	526.4116	566.4336	599.7383	556.5054	417.1955	280.0830	292.8194	420.2158	467.0948	453.7520	448.1984 (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	1170.9127	1135.5115	1028.2747	859.5084	660.0315	438.3379	283.3963	298.3943	474.3194	723.0418	964.0561	1166.7705 (97)
Space heating kWh	524.1581	409.3152	343.6098	187.0345	77.0234	0.0000	0.0000	0.0000	0.0000	190.4246	367.4189	534.6176 (98a)
Space heating requirement - total per year (kWh/year)												2633.6021
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	524.1581	409.3152	343.6098	187.0345	77.0234	0.0000	0.0000	0.0000	0.0000	190.4246	367.4189	534.6176 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2633.6021
Space heating per m2												36.1560 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan 4.3000	Feb 4.9000	Mar 6.5000	Apr 8.9000	May 11.7000	Jun 14.6000	Jul 16.6000	Aug 16.4000	Sep 14.1000	Oct 10.6000	Nov 7.1000	Dec 4.2000
Heat loss rate W												
	0.0000	0.0000	0.0000	0.0000	0.0000	740.1937	582.7057	597.4235	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8369	0.9022	0.8719	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	619.4556	525.7256	520.8939	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	772.5935	739.4981	686.4594	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	110.2593	159.0467	123.1808	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	27.5648	39.7617	30.7952	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												98.1217 (107)
Energy for space heating												36.1560 (99)
Energy for space cooling												1.3471 (108)
Total												37.5031 (109)
Fabric Energy Efficiency (DFEE)												37.5 (109)

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

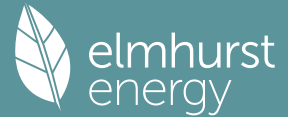
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	36.4200 (1b)	x 2.5000 (2b)	= 91.0500 (1b) - (3b)
First floor	36.4200 (1c)	x 2.6000 (2c)	= 94.6920 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.8400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 185.7420 (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)

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Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1615 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4115	(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) =	0.3498 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000	(22)
Wind factor	Jan 1.2750 Feb 1.2500 Mar 1.2250 Apr 1.1000 May 1.0750 Jun 0.9500 Jul 0.9500 Aug 0.9250 Sep 1.0000 Oct 1.0750 Nov 1.1250 Dec 1.1750	(22a)
Adj infilt rate	0.4460 0.4372 0.4285 0.3848 0.3760 0.3323 0.3323 0.3236 0.3498 0.3760 0.3935 0.4110	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		0.0000 (23c)
Effective ac	0.5994 0.5956 0.5918 0.5740 0.5707 0.5552 0.5552 0.5523 0.5612 0.5707 0.5774 0.5845	(25)

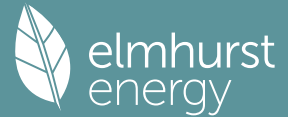
3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.1600	1.0000	2.1600		(26)
TER Opening Type			11.3400	1.1450	12.9847		(27)
GF			36.4200	0.1300	4.7346		(28a)
Main	87.5670	13.5000	74.0670	0.1800	13.3321		(29a)
PIJ	36.4200		36.4200	0.1100	4.0062		(30)
Total net area of external elements Aum(A, m2)			160.4070				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	37.2176	(33)
Main dwelling							
Party Wall 1			39.0800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							207.1658 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				10.0000	0.0500	0.5000	
E3 Sill				10.0000	0.0500	0.5000	
E4 Jamb				26.4900	0.0500	1.3245	
E5 Ground floor (normal)				17.1700	0.1600	2.7472	
E6 Intermediate floor within a dwelling				17.1700	0.0000	0.0000	
E16 Corner (normal)				10.1900	0.0900	0.9171	
E18 Party wall between dwellings				10.1900	0.0600	0.6114	
P1 Party wall - Ground floor				7.6700	0.0800	0.6136	
P4 Party wall - Roof (insulation at ceiling level)				7.6700	0.1200	0.9204	
E10 Eaves (insulation at ceiling level)				9.4900	0.0600	0.5694	
E12 Gable (insulation at ceiling level)				7.6700	0.0600	0.4602	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.1638 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	46.3814 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	Jan 36.7431 Feb 36.5064 Mar 36.2744 Apr 35.1846 May 34.9807 Jun 34.0316 Jul 34.0316 Aug 33.8558 Sep 34.3972 Oct 34.9807 Nov 35.3932 Dec 35.8244						(38)
Heat transfer coeff	83.1245 82.8878 82.6558 81.5660 81.3621 80.4130 80.4130 80.2372 80.7786 81.3621 81.7746 82.2058						(39)
Average = Sum(39)m / 12 =							81.5650
HLP	Jan 1.1412 Feb 1.1379 Mar 1.1348 Apr 1.1198 May 1.1170 Jun 1.1040 Jul 1.1040 Aug 1.1016 Sep 1.1090 Oct 1.1170 Nov 1.1227 Dec 1.1286						(40)
HLP (average)							1.1198
Days in mont	31 28 31 30 31 30 31 31 30 31 30 31						

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3131 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths	27.2161 26.8119 26.2427 25.1932 24.4074 23.5360 23.0653 23.6305 24.2460 25.1784 26.2495 27.1241											(42b)
Hot water usage for other uses	38.3180 36.9246 35.5312 34.1378 32.7444 31.3511 31.3511 32.7444 34.1378 35.5312 36.9246 38.3180											(42c)
Average daily hot water use (litres/day)												60.0682 (43)
Daily hot water use	Jan 65.5341 Feb 63.7365 Mar 61.7739 Apr 59.3311 May 57.1518 Jun 54.8871 Jul 54.4164 Aug 56.3750 Sep 58.3838 Oct 60.7096 Nov 63.1741 Dec 65.4421											(44)
Energy conte	103.7900 90.7600 94.9442 81.2213 76.9374 67.4901 65.8119 69.8040 71.9931 82.3823 90.0030 102.4665											(45)
Energy content (annual)										Total = Sum(45)m =		997.6037
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:												
Total storage loss	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000											(46)
If cylinder contains dedicated solar storage	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000											(57)
Primary loss	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000											(59)
Combi loss	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000											(61)
Total heat required for water heating calculated for each month	88.2215 77.1460 80.7026 69.0381 65.3968 57.3666 55.9401 59.3334 61.1941 70.0250 76.5026 87.0965											(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	88.2215 77.1460 80.7026 69.0381 65.3968 57.3666 55.9401 59.3334 61.1941 70.0250 76.5026 87.0965											(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		847.9632 (64)
												848 (64)

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Electric shower(s)	50.4541	44.9550	49.0891	46.8451	47.7242	45.5242	47.0417	47.7242	46.8451	49.0891	48.1661	50.4541 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												573.9120 (64a)
Heat gains from water heating, kWh/month	34.6689	30.5252	32.4479	28.9708	28.2802	25.7227	25.7455	26.7644	27.0098	29.7785	31.1672	34.3876 (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	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.8489	119.4041	107.8489	111.4438	107.8489	111.4438	107.8489	107.8489	111.4438	107.8489	111.4438	107.8489 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.8326	205.9478	200.6177	189.2705	174.9468	161.4845	152.4909	150.3757	155.7058	167.0530	181.3767	194.8390 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653 (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)	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221 (71)
Water heating gains (Table 5)	46.5980	45.4245	43.6128	40.2372	38.0111	35.7260	34.6041	35.9737	37.5136	40.0249	43.2877	46.2200 (72)
Total internal gains	415.9753	428.4721	409.7751	398.6474	378.5025	366.3501	352.6396	351.8940	362.3591	372.6225	393.8040	406.6036 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
North	1.5000	10.6334	0.6300	0.7000	0.7700	4.8746 (74)
East	3.8000	19.6403	0.6300	0.7000	0.7700	22.8088 (76)
West	6.0400	19.6403	0.6300	0.7000	0.7700	36.2540 (80)

Solar gains	63.9374	124.8549	206.1063	302.9336	374.3471	384.8156	365.6850	311.8719	240.3320	148.1862	79.6578	52.6341 (83)
Total gains	479.9126	553.3271	615.8815	701.5810	752.8497	751.1657	718.3247	663.7659	602.6911	520.8087	473.4618	459.2377 (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	50.4262	50.5702	50.7122	51.3897	51.5185	52.1266	52.1266	52.2408	51.8907	51.5185	51.2586	50.9898
alpha	4.3617	4.3713	4.3808	4.4260	4.4346	4.4751	4.4751	4.4827	4.4594	4.4346	4.4172	4.3993
util living area	0.9936	0.9874	0.9729	0.9243	0.8181	0.6397	0.4818	0.5375	0.7835	0.9519	0.9877	0.9947 (86)
MIT	19.4458	19.6550	19.9766	20.4201	20.7586	20.9413	20.9867	20.9789	20.8538	20.3993	19.8546	19.4196 (87)
Th 2	19.9673	19.9700	19.9725	19.9847	19.9870	19.9976	19.9976	19.9996	19.9935	19.9870	19.9824	19.9776 (88)
util rest of house	0.9918	0.9839	0.9652	0.9025	0.7684	0.5558	0.3772	0.4292	0.7098	0.9335	0.9837	0.9933 (89)
MIT 2	18.5581	18.7674	19.0860	19.5205	19.8228	19.9691	19.9937	19.9928	19.9106	19.5111	18.9762	18.5397 (90)
Living area fraction	18.7287	18.9380	19.2572	19.6934	20.0027	20.1560	20.1846	20.1823	20.0919	19.6818	19.1450	18.7088 (92)
MIT	18.7287	18.9380	19.2572	19.6934	20.0027	20.1560	20.1846	20.1823	20.0919	19.6818	19.1450	18.7088 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7287	18.9380	19.2572	19.6934	20.0027	20.1560	20.1846	20.1823	20.0919	19.6818	19.1450	18.7088 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9889	0.9793	0.9582	0.8950	0.7692	0.5698	0.3972	0.4497	0.7179	0.9264	0.9792	0.9907 (94)
Ext temp.	474.5750	541.8547	590.1654	627.9196	579.1263	427.9798	285.3280	298.4785	432.6594	482.4956	463.6057	454.9729 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Space heating kWh	1199.3792	1163.5777	1054.4535	880.3728	675.5242	446.7731	288.2474	303.4806	484.0186	738.9182	984.9735	1192.7104 (97)
Space heating requirement - total per year (kWh/year)	539.2543	417.7979	345.4304	181.7663	71.7200	0.0000	0.0000	0.0000	0.0000	190.7784	375.3848	548.8767 (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)	539.2543	417.7979	345.4304	181.7663	71.7200	0.0000	0.0000	0.0000	0.0000	190.7784	375.3848	548.8767 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2671.0088
Space heating per m ²												36.6695 (99)

8c. Space cooling requirement

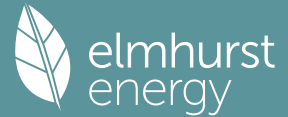
Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	755.8819	595.0560	609.8027	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8549	0.9142	0.8852	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	646.1892	544.0101	539.7825	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	833.4209	797.2752	735.6466	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	134.8068	188.4293	145.7229	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	33.7017	47.1073	36.4307	0.0000	0.0000	0.0000	0.0000 (107)

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Space cooling requirement	117.2398 (107)
Energy for space heating	36.6695 (99)
Energy for space cooling	1.6096 (108)
Total	38.2791 (109)
Fabric Energy Efficiency (TFEE)	38.3 (109)

Full SAP Calculation Printout



Property Reference	HT06-Semi			Issued on Date	07/05/2025
Assessment Reference	001	Prop Type Ref			
Property	Highmoor Lane, CLECKHEATON, BD19 6LW				
SAP Rating	92 A	DER	12.01	TER	12.63
Environmental	90 B	% DER < TER			4.91
CO ₂ Emissions (t/year)	0.86	DFEE	37.50	TFEE	38.28
Compliance Check	See BREL	% DFEE < TFEE			2.03
% DPER < TPER	3.92	DPER	63.54	TPER	66.13
Assessor Details	Mr. Paul Goddard			Assessor ID	B342-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	36.4200 (1b)	x 2.5000 (2b)	= 91.0500 (1b) - (3b)
First floor	36.4200 (1c)	x 2.6000 (2c)	= 94.6920 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.8400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 185.7420 (5)

2. Ventilation rate

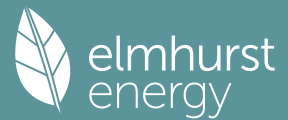
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.2000 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1700 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			2.1600	1.0000	2.1600		(26)
Window			9.1900	1.1450	10.5229		(27)
Patio Door			2.1500	1.3258	2.8504		(27)
GF			36.4200	0.1100	4.0062	9.0000	(28a)
Main	87.5670	13.5000	74.0670	0.1800	13.3321	18.0000	1333.2060 (29a)
PIJ	36.4200		36.4200	0.0900	3.2778	9.0000	327.7800 (30)
Total net area of external elements Aum(A, m ²)			160.4070				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1493		(33)
Main dwelling							
Party Wall 1			39.0800	0.0000	0.0000	20.0000	781.6000 (32)
Internal Wall 1			151.1500			75.0000	11336.2495 (32c)
Internal Floor 1			36.4200			18.0000	655.5600 (32d)
Internal Ceiling 1			36.4200			9.0000	327.7800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	15089.9556 (34)

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

207.1658 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.0000	0.0500	0.5000
E3 Sill	10.0000	0.0500	0.5000
E4 Jamb	26.4900	0.0500	1.3245
E5 Ground floor (normal)	17.1700	0.1000	1.7170
E6 Intermediate floor within a dwelling	17.1700	0.0700	1.2019
E16 Corner (normal)	10.1900	0.0900	0.9171
E18 Party wall between dwellings	10.1900	0.0600	0.6114
P1 Party wall - Ground floor	7.6700	0.0800	0.6136
P4 Party wall - Roof (insulation at ceiling level)	7.6700	0.1200	0.9204
E10 Eaves (insulation at ceiling level)	9.4900	0.0600	0.5694
E12 Gable (insulation at ceiling level)	7.6700	0.0600	0.4602

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

9.3355 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 45.4848 (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	30.6474	30.6474	30.6474	30.6474	30.6474	30.6474	30.6474	30.6474	30.6474	30.6474	30.6474	30.6474
Average = Sum(39)m / 12 =	76.1323	76.1323	76.1323	76.1323	76.1323	76.1323	76.1323	76.1323	76.1323	76.1323	76.1323	76.1323

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0452	1.0452	1.0452	1.0452	1.0452	1.0452	1.0452	1.0452	1.0452	1.0452	1.0452	1.0452
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.3131 (42)											
Hot water usage for mixer showers	63.0020 62.0552 60.6755 58.0357 56.0877 53.9152 52.6804 54.0496 55.5505 57.8831 60.5795 62.7606 (42a)											
Hot water usage for baths	27.2161 26.8119 26.2427 25.1932 24.4074 23.5360 23.0653 23.6305 24.2460 25.1784 26.2495 27.1241 (42b)											
Hot water usage for other uses	38.3180 36.9246 35.5312 34.1378 32.7444 31.3511 31.3511 32.7444 34.1378 35.5312 36.9246 38.3180 (42c)											
Average daily hot water use (litres/day)	118.1538 (43)											
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	128.5360	125.7917	122.4494	117.3668	113.2395	108.8023	107.0968	110.4246	113.9343	118.5927	123.7536	128.2027 (44)
Energy content (annual)	203.5697	179.1257	188.2002	160.6693	152.4421	133.7851	129.5243	136.7287	140.4924	160.9291	176.3097	200.7344 (45)
Distribution loss (46)m = 0.15 x (45)m	30.5355 26.8688 28.2300 24.1004 22.8663 20.0678 19.4286 20.5093 21.0739 24.1394 26.4465 30.1102 (46)											
Water storage loss:	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (56)											
Total storage loss	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (57)											
If cylinder contains dedicated solar storage	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (59)											
Primary loss	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)											
Combi loss	1.7065 1.5557 1.7037 1.5443 1.5344 1.4119 1.3913 1.4186 1.4034 1.5251 1.5708 1.6901 (62)											
Total heat required for water heating calculated for each month	205.2762 180.6814 189.9039 162.2136 153.9766 135.1970 130.9155 138.1473 141.8958 162.4542 177.8805 202.4245 (63a)											
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 (63b)											
FV 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 (63c)											
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 (63d)											
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 (64)											
Output from w/h	205.2762 180.6814 189.9039 162.2136 153.9766 135.1970 130.9155 138.1473 141.8958 162.4542 177.8805 202.4245 (64)											
12Total per year (kWh/year)	1980.9665 (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	68.1136 59.9482 63.0025 53.8086 51.0706 44.8365 43.4146 45.8169 47.0646 53.8902 59.0157 67.1667 (65)											

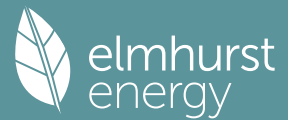
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.8489	119.4041	107.8489	111.4438	107.8489	111.4438	107.8489	107.8489	111.4438	107.8489	111.4438	107.8489 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.8326	205.9478	200.6177	189.2705	174.9468	161.4845	152.4909	150.3757	155.7058	167.0530	181.3767	194.8390 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653 (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)	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221 (71)
Water heating gains (Table 5)	91.5505	89.2086	84.6808	74.7342	68.6433	62.2730	58.3530	61.5819	65.3675	72.4331	81.9662	90.2778 (72)
Total internal gains	463.9278	475.2563	453.8431	436.1443	412.1348	392.8971	376.3885	377.5023	390.2129	408.0307	435.4825	453.6615 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	1.5000	10.6334	0.3300	0.0000	0.7700	4.0529 (74)
East	3.8000	19.6403	0.3300	0.0000	0.7700	18.9642 (76)
West	3.8900	19.6403	0.3300	0.0000	0.7700	19.4134 (80)
West	2.1500	19.6403	0.6300	0.7000	0.7700	12.9050 (80)

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Solar gains	55.3355	108.0650	178.3735	262.0925	323.7739	332.7745	316.2535	269.7896	207.9728	128.2576	68.9432	45.5511 (83)
Total gains	519.2633	583.3213	632.2166	698.2369	735.9087	725.6715	692.6420	647.2919	598.1857	536.2883	504.4257	499.2125 (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	55.0575	55.0575	55.0575	55.0575	55.0575	55.0575	55.0575	55.0575	55.0575	55.0575	55.0575	55.0575
alpha	4.6705	4.6705	4.6705	4.6705	4.6705	4.6705	4.6705	4.6705	4.6705	4.6705	4.6705	4.6705
util living area	0.9909	0.9834	0.9670	0.9163	0.8074	0.6331	0.4751	0.5265	0.7663	0.9413	0.9833	0.9924 (86)
MIT	19.6825	19.8649	20.1426	20.5101	20.8018	20.9516	20.9897	20.9836	20.8835	20.5004	20.0213	19.6360 (87)
Th 2	20.0458	20.0458	20.0458	20.0458	20.0458	20.0458	20.0458	20.0458	20.0458	20.0458	20.0458	20.0458 (88)
util rest of house	0.9885	0.9791	0.9580	0.8935	0.7583	0.5526	0.3762	0.4241	0.6937	0.9203	0.9781	0.9904 (89)
MIT 2	18.5148	18.7459	19.0952	19.5440	19.8731	20.0155	20.0419	20.0390	19.9616	19.5420	18.9465	18.4556 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.7392	18.9610	19.2965	19.7297	20.0516	20.1954	20.2241	20.2206	20.1388	19.7262	19.1530	18.6825 (92)
Temperature adjustment												
adjusted MIT	18.5892	18.8110	19.1465	19.5797	19.9016	20.0454	20.0741	20.0706	19.9888	19.5762	19.0030	18.5325 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9832	0.9713	0.9470	0.8801	0.7500	0.5526	0.3792	0.4268	0.6888	0.9071	0.9702	0.9858 (94)
Useful gains	510.5515	566.5863	598.6899	614.4876	551.9455	400.9979	262.6592	276.2795	412.0476	486.4727	489.3873	492.1047 (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	1087.8704	1059.0764	962.8075	813.0663	624.4062	414.5723	264.4899	279.4476	448.3263	683.3777	906.2060	1091.1656 (97)
Space heating kWh	429.5253	330.9534	270.9035	142.9766	53.9107	0.0000	0.0000	0.0000	0.0000	146.4974	300.1095	445.7013 (98a)
Space heating requirement - total per year (kWh/year)	2120.5777											
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	429.5253	330.9534	270.9035	142.9766	53.9107	0.0000	0.0000	0.0000	0.0000	146.4974	300.1095	445.7013 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2120.5777											
Space heating per m2	(98c) / (4) = 29.1128 (99)											

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)											
Fraction of space heat from main system(s)	1.0000 (202)											
Efficiency of main space heating system 1 (in %)	88.7000 (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	429.5253	330.9534	270.9035	142.9766	53.9107	0.0000	0.0000	0.0000	0.0000	146.4974	300.1095	445.7013 (98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)
Space heating fuel (main heating system)	484.2450	373.1154	305.4155	161.1913	60.7787	0.0000	0.0000	0.0000	0.0000	165.1605	338.3421	502.4818 (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	205.2762	180.6814	189.9039	162.2136	153.9766	135.1970	130.9155	138.1473	141.8958	162.4542	177.8805	202.4245 (64)
Efficiency of water heater	84.2318	83.8429	83.0833	81.5864	79.0904	76.2000	76.2000	76.2000	76.2000	81.6565	83.5967	76.2000 (216)
Fuel for water heating, kWh/month	243.7039	215.4998	228.5705	198.8243	194.6843	177.4239	171.8052	181.2957	186.2150	198.9482	212.7841	239.9048 (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	10.3927	9.3870	10.3927	10.0575	10.3927	10.0575	10.3927	10.3927	10.0575	10.3927	10.0575	10.3927 (231)
Lighting	23.3147	18.7039	16.8408	12.3383	9.5305	7.7865	8.6940	11.3008	14.6786	19.2592	21.7532	23.9627 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-22.5671	-35.5759	-57.4975	-70.7400	-79.9685	-75.8502	-74.5891	-68.3378	-57.2724	-43.0679	-25.8406	-18.9166 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-9.1062	-22.2614	-53.1457	-93.3517	-135.1533	-140.4066	-136.8231	-108.3547	-69.8348	-34.2752	-12.7379	-6.8929 (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	2390.7303 (211)											
Space heating fuel - main system 2	0.0000 (213)											
Space heating fuel - secondary	0.0000 (215)											
Efficiency of water heater	76.2000											
Water heating fuel used	2449.6598 (219)											
Space cooling fuel	0.0000 (221)											

Electricity for pumps and fans:
(MEVDcentralised, Database: total watage = 4.6540, total flow = 29.0000, SFP = 0.1605)

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mechanical ventilation fans (SFP = 0.1605)	36.3662 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	122.3662 (231)
Electricity for lighting (calculated in Appendix L)	188.1633 (232)

Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1452.5668 (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	3698.3528 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2390.7303	0.2100	502.0534 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2449.6598	0.2100	514.4286 (264)
Space and water heating			1016.4819 (265)
Pumps, fans and electric keep-hot	122.3662	0.1432	17.3615 (267)
Energy for lighting	188.1633	0.1490	28.0400 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-630.2235	0.1371	-86.4059
PV Unit electricity exported	-822.3433	0.1222	-100.5028
Total			-186.9087 (269)
Total CO2, kg/year			874.9748 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.0100 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2390.7303	1.1300	2701.5252 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2449.6598	1.1300	2768.1155 (278)
Space and water heating			5469.6407 (279)
Pumps, fans and electric keep-hot	122.3662	1.5335	186.9002 (281)
Energy for lighting	188.1633	1.5547	292.5458 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-630.2235	1.5112	-952.4034
PV Unit electricity exported	-822.3433	0.4484	-368.7677
Total			-1321.1711 (283)
Total Primary energy kWh/year			4627.9156 (286)
Dwelling Primary energy Rate (DPER)			63.5400 (287)

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

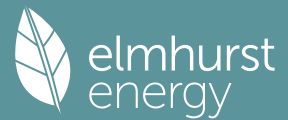
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	36.4200 (1b)	x 2.5000 (2b)	= 91.0500 (1b) - (3b)
First floor	36.4200 (1c)	x 2.6000 (2c)	= 94.6920 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.8400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	185.7420 (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) = 0.1615 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4115 (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) = 0.3498 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4460	0.4372	0.4285	0.3848	0.3760	0.3323	0.3323	0.3236	0.3498	0.3760	0.3935	0.4110 (22b)
	0.5994	0.5956	0.5918	0.5740	0.5707	0.5552	0.5552	0.5523	0.5612	0.5707	0.5774	0.5845 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.1600	1.0000	2.1600		(26)
TER Opening Type			11.3400	1.1450	12.9847		(27)
GF			36.4200	0.1300	4.7346		(28a)
Main	87.5670	13.5000	74.0670	0.1800	13.3321		(29a)
PIJ	36.4200		36.4200	0.1100	4.0062		(30)
Total net area of external elements Aum(A, m2)			160.4070				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.2176		(33)
Main dwelling							
Party Wall 1			39.0800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							207.1658 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value		Total
E2 Other lintels (including other steel lintels)				10.0000	0.0500		0.5000
E3 Sill				10.0000	0.0500		0.5000
E4 Jamb				26.4900	0.0500		1.3245
E5 Ground floor (normal)				17.1700	0.1600		2.7472
E6 Intermediate floor within a dwelling				17.1700	0.0000		0.0000
E16 Corner (normal)				10.1900	0.0900		0.9171
E18 Party wall between dwellings				10.1900	0.0600		0.6114
P1 Party wall - Ground floor				7.6700	0.0800		0.6136
P4 Party wall - Roof (insulation at ceiling level)				7.6700	0.1200		0.9204
E10 Eaves (insulation at ceiling level)				9.4900	0.0600		0.5694
E12 Gable (insulation at ceiling level)				7.6700	0.0600		0.4602
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.1638 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	46.3814 (37)

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

(38)m	Jan 36.7431	Feb 36.5064	Mar 36.2744	Apr 35.1846	May 34.9807	Jun 34.0316	Jul 34.0316	Aug 33.8558	Sep 34.3972	Oct 34.9807	Nov 35.3932	Dec 35.8244 (38)
Heat transfer coeff	83.1245	82.8878	82.6558	81.5660	81.3621	80.4130	80.4130	80.2372	80.7786	81.3621	81.7746	82.2058 (39)
Average = Sum(39)m / 12 =												81.5650
HLP	Jan 1.1412	Feb 1.1379	Mar 1.1348	Apr 1.1198	May 1.1170	Jun 1.1040	Jul 1.1040	Aug 1.1016	Sep 1.1090	Oct 1.1170	Nov 1.1227	Dec 1.1286 (40)
HLP (average)												1.1198
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

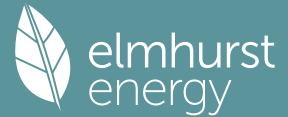
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3131 (42)
Hot water usage for mixer showers												
63.0020	62.0552	60.6755	58.0357	56.0877	53.9152	52.6804	54.0496	55.5505	57.8831	60.5795	62.7606 (42a)	
Hot water usage for baths												
27.2161	26.8119	26.2427	25.1932	24.4074	23.5360	23.0653	23.6305	24.2460	25.1784	26.2495	27.1241 (42b)	
Hot water usage for other uses												
38.3180	36.9246	35.5312	34.1378	32.7444	31.3511	31.3511	32.7444	34.1378	35.5312	36.9246	38.3180 (42c)	
Average daily hot water use (litres/day)												118.1538 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
128.5360	125.7917	122.4494	117.3668	113.2395	108.8023	107.0968	110.4246	113.9343	118.5927	123.7536	128.2027 (44)	
Energy content (annual)	203.5697	179.1257	188.2002	160.6693	152.4421	133.7851	129.5243	136.7287	140.4924	160.9291	176.3097	200.7344 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1962.5107
30.5355	26.8688	28.2300	24.1004	22.8663	20.0678	19.4286	20.5093	21.0739	24.1394	26.4465	30.1102 (46)	
Water storage loss:												
Total storage loss												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)	
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)	
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
254.5286	225.1531	239.1591	209.9844	203.4010	183.1002	180.4832	187.6876	189.8075	211.8880	225.6248	251.6933 (62)	
WWHRS	-28.8019	-25.4726	-26.6734	-22.0867	-20.5840	-17.6139	-16.5102	-17.5569	-18.2240	-21.4841	-24.3388	-28.2685 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)	
Output from w/h	225.7267	199.6805	212.4857	187.8977	182.8171	165.4863	163.9730	170.1307	171.5835	190.4040	201.2859	223.4248 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2294.8958 (64)
Electric shower(s)												2295 (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)	
Heat gains from water heating, kWh/month	80.4266	71.0661	75.3163	65.7513	63.4267	56.8123	55.8065	58.2020	59.0425	66.2487	70.9517	79.4839 (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	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526	115.6526 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	107.8489	119.4041	107.8489	111.4438	107.8489	111.4438	107.8489	107.8489	111.4438	107.8489	111.4438	107.8489 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	203.8326	205.9478	200.6177	189.2705	174.9468	161.4845	152.4909	150.3757	155.7058	167.0530	181.3767	194.8390 (68)

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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653	34.5653 (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)	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221	-92.5221 (71)
Water heating gains (Table 5)	108.1003	105.7532	101.2316	91.3213	85.2510	78.9060	75.0088	78.2285	82.0035	89.0439	98.5441	106.8332 (72)
Total internal gains	480.4776	491.8008	470.3939	452.7314	428.7425	409.5301	393.0443	394.1489	406.8489	424.6415	452.0604	470.2169 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				1.5000	10.6334	0.6300	0.7000	0.7700	4.8746 (74)			
East				3.8000	19.6403	0.6300	0.7000	0.7700	22.8088 (76)			
West				6.0400	19.6403	0.6300	0.7000	0.7700	36.2540 (80)			
Solar gains	63.9374	124.8549	206.1063	302.9336	374.3471	384.8156	365.6850	311.8719	240.3320	148.1862	79.6578	52.6341 (83)
Total gains	544.4150	616.6558	676.5002	755.6650	803.0896	794.3458	758.7294	706.0208	647.1809	572.8277	531.7182	522.8509 (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	50.4262	50.5702	50.7122	51.3897	51.5185	52.1266	52.1266	52.2408	51.8907	51.5185	51.2586	50.9898
alpha	4.3617	4.3713	4.3808	4.4260	4.4346	4.4751	4.4751	4.4827	4.4594	4.4346	4.4172	4.3993
util living area	0.9897	0.9813	0.9627	0.9061	0.7909	0.6118	0.4580	0.5088	0.7511	0.9349	0.9811	0.9913 (86)
MIT	19.5515	19.7553	20.0655	20.4822	20.7917	20.9508	20.9892	20.9830	20.8777	20.4676	19.9471	19.5247 (87)
Th 2	19.9673	19.9700	19.9725	19.9847	19.9870	19.9976	19.9976	19.9996	19.9935	19.9870	19.9824	19.9776 (88)
util rest of house	0.9869	0.9763	0.9525	0.8807	0.7384	0.5292	0.3577	0.4046	0.6748	0.9117	0.9752	0.9890 (89)
MIT 2	18.2931	18.5530	18.9444	19.4601	19.8084	19.9674	19.9936	19.9927	19.9068	19.4558	18.8072	18.2662 (90)
Living area fraction									FLA = Living area / (4) =			0.1922 (91)
MIT	18.5350	18.7841	19.1599	19.6566	19.9974	20.1564	20.1849	20.1830	20.0934	19.6502	19.0263	18.5081 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5350	18.7841	19.1599	19.6566	19.9974	20.1564	20.1849	20.1830	20.0934	19.6502	19.0263	18.5081 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9814	0.9685	0.9422	0.8710	0.7390	0.5429	0.3768	0.4243	0.6831	0.9021	0.9676	0.9841 (94)
Useful gains	534.3114	597.2595	637.3756	658.1843	593.5147	431.2555	285.9117	299.5653	442.0870	516.7239	514.4850	514.5428 (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	1183.2763	1150.8205	1046.4110	877.3696	675.0909	446.8101	288.2755	303.5374	484.1354	736.3468	975.2678	1176.2103 (97)
Space heating kWh	482.8299	371.9930	304.3223	157.8134	60.6927	0.0000	0.0000	0.0000	0.0000	163.3995	331.7636	492.2806 (98a)
Space heating requirement - total per year (kWh/year)												2365.0951
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	482.8299	371.9930	304.3223	157.8134	60.6927	0.0000	0.0000	0.0000	0.0000	163.3995	331.7636	492.2806 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2365.0951
Space heating per m2										(98c) / (4) =		32.4697 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (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
	482.8299	371.9930	304.3223	157.8134	60.6927	0.0000	0.0000	0.0000	0.0000	163.3995	331.7636	492.2806 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	522.5432	402.5899	329.3532	170.7938	65.6847	0.0000	0.0000	0.0000	0.0000	176.8392	359.0515	532.7712 (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	225.7267	199.6805	212.4857	187.8977	182.8171	165.4863	163.9730	170.1307	171.5835	190.4040	201.2859	223.4248 (64)
Efficiency of water heater (217)m	85.9669	85.6943	85.1505	84.0099	82.2840	80.3000	80.3000	80.3000	80.3000	84.0554	85.4445	80.3000 (216)
Fuel for water heating, kWh/month	262.5739	233.0149	249.5412	223.6615	222.1783	206.0851	204.2005	211.8689	213.6781	226.5221	235.5751	259.7240 (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	22.4089	17.9772	16.1865	11.8589	9.1602	7.4839	8.3562	10.8617	14.1083	18.5109	20.9080	23.0317 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-34.1499	-48.1810	-69.3106	-78.0013	-84.1795	-78.6084	-77.6485	-73.2781	-65.5622	-55.1391	-37.5614	-29.5213 (233a)

Full SAP Calculation Printout



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	-19.1761	-40.3577	-80.2442	-120.5616	-159.4464	-160.2096	-158.3126	-134.0165	-98.2034	-57.7147	-25.6038	-15.1616	(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												2559.6267	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2748.6235	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												180.8524	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1800.1497	(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												3774.9530	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2559.6267	0.2100	537.5216	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2748.6235	0.2100	577.2109	(264)
Space and water heating			1114.7326	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	180.8524	0.1443	26.1026	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.1414	0.1346	-98.3862	
PV Unit electricity exported	-1069.0083	0.1259	-134.5751	
Total			-232.9613	(269)
Total CO2, kg/year			919.8031	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.6300	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2559.6267	1.1300	2892.3782	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2748.6235	1.1300	3105.9446	(278)
Space and water heating			5998.3228	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	180.8524	1.5338	277.3974	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.1414	1.4973	-1094.7592	
PV Unit electricity exported	-1069.0083	0.4621	-493.9831	
Total			-1588.7422	(283)
Total Primary energy kWh/year			4817.0788	(286)
Target Primary Energy Rate (TPER)			66.1300	(287)

Predicted Energy Assessment



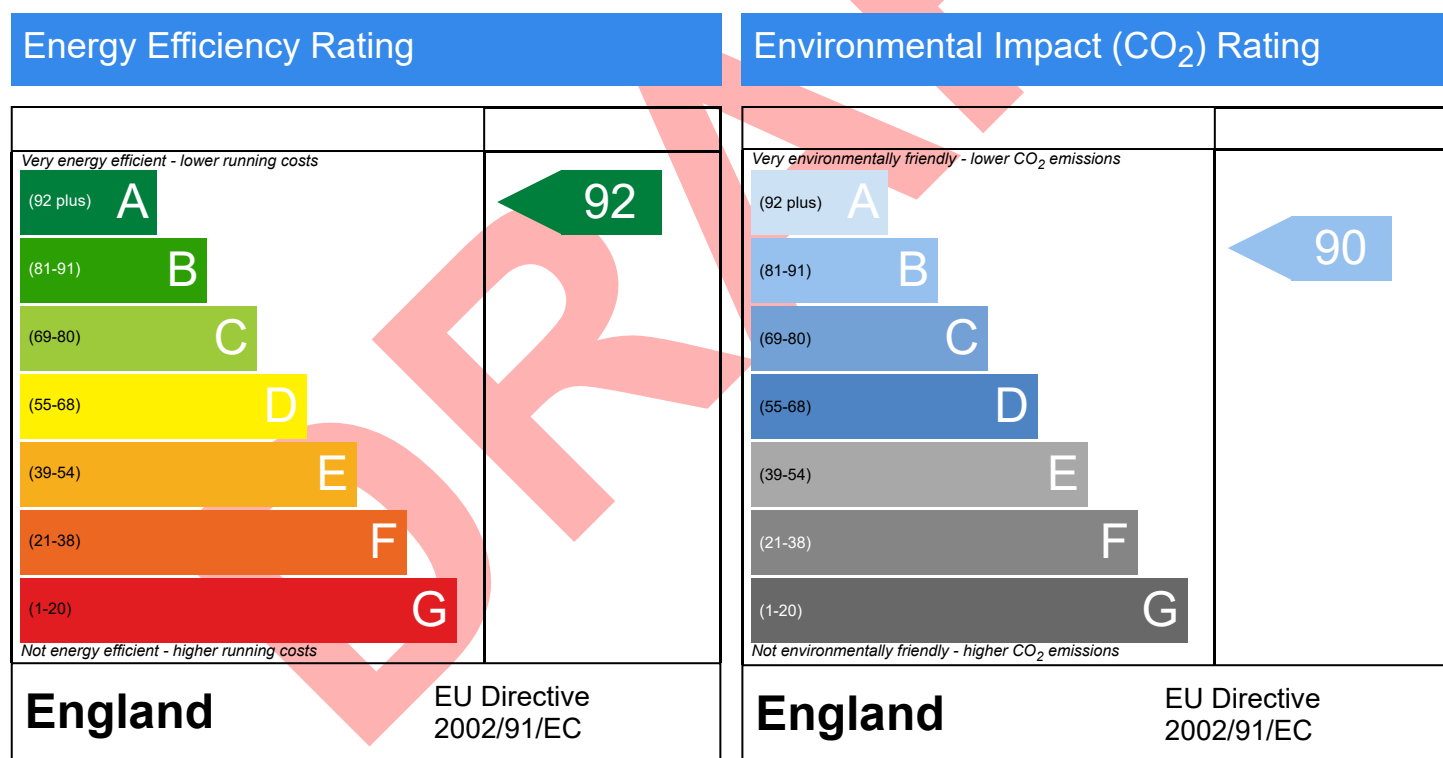
Highmoor Lane, CLECKHEATON, BD19 6LW

Dwelling type:
Date of assessment:
Produced by:
Total floor area:
DRRN:

House, Semi-Detached
07/05/2025
Paul Goddard
72.84 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

Energy Report



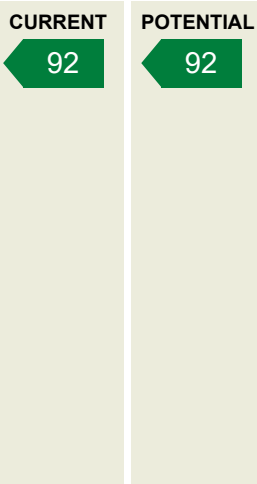
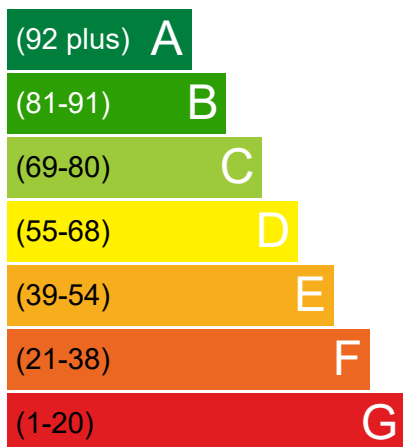
Dwelling Address	Highmoor Lane, CLECKHEATON, BD19 6LW
Reference	HT06-Semi-001
Assessment Date	07/05/2025
Submission Date	
Property Type	House, Semi-Detached
Total Floor Area	73

This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

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

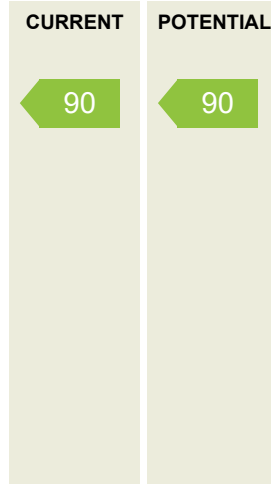
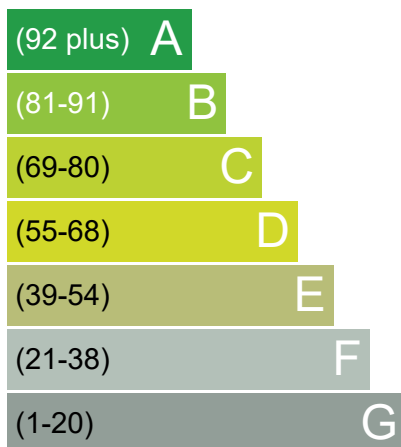
Energy Efficiency Rating

Most energy efficient - lower running costs

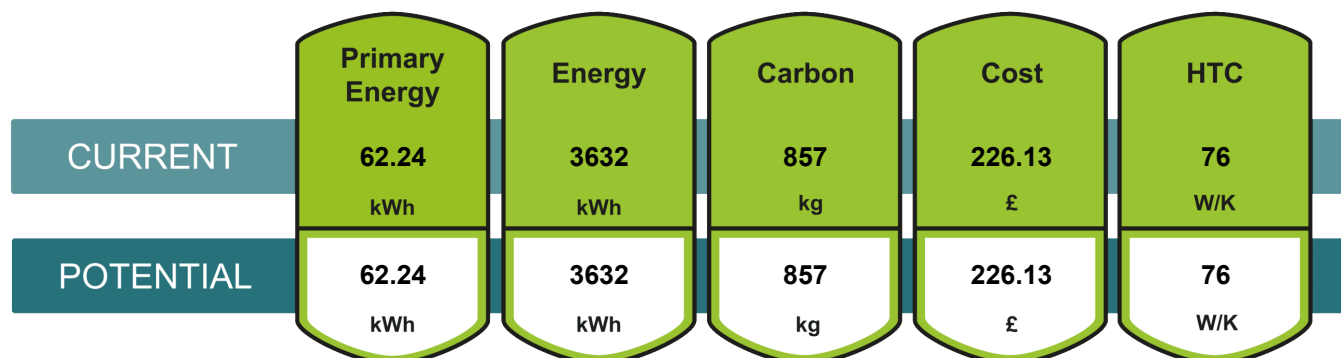


Carbon Dioxide (CO2) Emissions Rating

Very environmentally friendly - lower CO2 emissions



Additional ratings for your home



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 0.18 W/m ² K	Very Good
Roof	Average thermal transmittance 0.09 W/m ² K	Very Good
Floor	Average thermal transmittance 0.11 W/m ² K	Very Good
Windows	High performance glazing	Good
Main heating	Boiler and radiators, mains gas	Very Good
Main heating controls	Time and temperature zone control	Very Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 4.0 m ³ /h.m ² (assumed)	Good

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 measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating
Solar water heating	£18	A 93			A 92

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

		Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting		£56	£56	
Heating		£261	£261	
Hot Water		£137	£137	
New Technologies e.g. Impact of PV		-(£228)	-(£228)	
TOTAL		£226	£226	

Estimated energy use and potential savings



Space Heating

2274
kWh per year



Water Heating

2452
kWh per year

About this document

Created by:
Company/Trading name:
Phone number:
Email address:

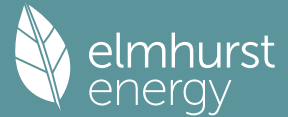
Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g. heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO ₂)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Full SAP Calculation Printout



Property Reference	HT09-Semi			Issued on Date	07/05/2025
Assessment Reference	001	Prop Type Ref			
Property	Highmoor Lane, CLECKHEATON, BD19 6LW				
SAP Rating	94 A	DER	10.38	TER	10.71
Environmental	91 B	% DER < TER			3.08
CO ₂ Emissions (t/year)	0.97	DFEE	35.00	TFEE	35.61
Compliance Check	See BREL	% DFEE < TFEE			1.71
% DPER < TPER	2.06	DPER	54.75	TPER	55.90
Assessor Details	Mr. Paul Goddard			Assessor ID	B342-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	47.4100 (1b)	x 2.5000 (2b)	= 118.5250 (1b) - (3b)
First floor	47.4100 (1c)	x 2.6000 (2c)	= 123.2660 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	241.7910 (5)

2. Ventilation rate

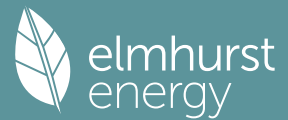
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.2000 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1700 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			2.1600	1.0000	2.1600		(26)
Window			10.3900	1.1450	11.8969		(27)
Patio Door			3.3300	1.3258	4.4148		(27)
GF			47.4100	0.1100	5.2151	9.0000	426.6900 (28a)
Main	100.1640	15.8800	84.2840	0.1800	15.1711	18.0000	1517.1119 (29a)
PIJ	47.4100		47.4100	0.0900	4.2669	9.0000	426.6900 (30)
Total net area of external elements Aum(A, m ²)			194.9840				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.1248		(33)
Main dwelling							
Party Wall 1			43.6300	0.0000	0.0000	20.0000	872.6000 (32)
Internal Wall 1			120.4500			75.0000	9033.7498 (32c)
Internal Floor 1			47.4100			18.0000	853.3800 (32d)
Internal Ceiling 1			47.4100			9.0000	426.6900 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13556.9117 (34)

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Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												142.9752 (35)
List of Thermal Bridges												
K1 Element												
E2 Other lintels (including other steel lintels)												
E3 Sill												
E4 Jamb												
E5 Ground floor (normal)												
E6 Intermediate floor within a dwelling												
E16 Corner (normal)												
E18 Party wall between dwellings												
P1 Party wall - Ground floor												
P4 Party wall - Roof (insulation at ceiling level)												
E10 Eaves (insulation at ceiling level)												
E12 Gable (insulation at ceiling level)												
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												10.2437 (36)
Point Thermal bridges												0.0000
Total fabric heat loss												(33) + (36) + (36a) = 53.3685 (37)

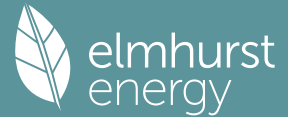
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	39.8955	39.8955	39.8955	39.8955	39.8955	39.8955	39.8955	39.8955	39.8955	39.8955	39.8955	39.8955
Average = Sum(39)m / 12 =	93.2641	93.2641	93.2641	93.2641	93.2641	93.2641	93.2641	93.2641	93.2641	93.2641	93.2641	93.2641
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9836	0.9836	0.9836	0.9836	0.9836	0.9836	0.9836	0.9836	0.9836	0.9836	0.9836	0.9836
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.6861 (42)
Hot water usage for mixer showers												
Hot water usage for baths												
Hot water usage for other uses												
Average daily hot water use (litres/day)												129.8883 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	141.3019	138.2846	134.6102	129.0228	124.4855	119.6075	117.7329	121.3914	125.2500	130.3710	136.0444	140.9354
Energy content (annual)	223.7876	196.9154	206.8908	176.6258	167.5814	147.0714	142.3877	150.3080	154.4457	176.9122	193.8202	220.6708
Distribution loss (46)m = 0.15 x (45)m												2157.4171
Water storage loss:												
Total storage loss												
If cylinder contains dedicated solar storage												
Primary loss												
Combi loss												
Total heat required for water heating calculated for each month												
WWHRS												
FV diverter												
Solar input												
FGHRS												
Output from w/h												
12Total per year (kWh/year)												
Electric shower(s)												
Heat gains from water heating, kWh/month												

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	134.3061	134.3061	134.3061	134.3061	134.3061	134.3061	134.3061	134.3061	134.3061	134.3061	134.3061	134.3061
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	133.0665	147.3236	133.0665	137.5020	133.0665	137.5020	133.0665	133.0665	137.5020	133.0665	137.5020	133.0665
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	247.6715	250.2415	243.7651	229.9774	212.5731	196.2154	185.2875	182.7174	189.1939	202.9815	220.3859	236.7435
Pumps, fans	36.4306	36.4306	36.4306	36.4306	36.4306	36.4306	36.4306	36.4306	36.4306	36.4306	36.4306	36.4306
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000
Water heating gains (Table 5)	-107.4449	-107.4449	-107.4449	-107.4449	-107.4449	-107.4449	-107.4449	-107.4449	-107.4449	-107.4449	-107.4449	-107.4449
Total internal gains	100.5374	97.9677	92.9976	82.0776	75.3907	68.3966	64.0922	67.6370	71.7928	79.5499	90.0158	99.1401
	547.5672	561.8246	536.1210	515.8489	487.3221	465.4059	445.7381	446.7128	461.7806	481.8897	514.1956	535.2420

6. Solar gains												
[Jan]												
		Area	Solar flux	g	FF				Access		Gains	
		m2	Table 6a	W/m2	Specific data	Specific data			factor		W	
					or Table 6b	or Table 6c			Table 6d			
Southeast		4.6700	36.7938	0.3300	0.0000			0.7700		43.6613	(77)	
Southwest		1.4500	36.7938	0.3300	0.0000			0.7700		13.5565	(79)	
Northwest		4.2700	11.2829	0.3300	0.0000			0.7700		12.2421	(81)	
Northwest		3.3300	11.2829	0.6300	0.7000			0.7700		11.4826	(81)	

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Solar gains	80.9424	145.7552	220.3603	308.1218	377.1457	388.5045	368.6978	315.0493	250.4129	166.7343	98.3854	68.3412 (83)
Total gains	628.5096	707.5799	756.4813	823.9707	864.4678	853.9104	814.4358	761.7621	712.1934	648.6240	612.5810	603.5832 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	40.3779	40.3779	40.3779	40.3779	40.3779	40.3779	40.3779	40.3779	40.3779	40.3779	40.3779	40.3779
alpha	3.6919	3.6919	3.6919	3.6919	3.6919	3.6919	3.6919	3.6919	3.6919	3.6919	3.6919	3.6919
util living area	0.9788	0.9661	0.9448	0.8905	0.7882	0.6301	0.4831	0.5315	0.7453	0.9116	0.9659	0.9816 (86)
MIT	19.3124	19.5351	19.8581	20.2930	20.6669	20.8946	20.9698	20.9568	20.7981	20.3219	19.7379	19.2550 (87)
Th 2	20.0970	20.0970	20.0970	20.0970	20.0970	20.0970	20.0970	20.0970	20.0970	20.0970	20.0970	20.0970 (88)
util rest of house	0.9748	0.9599	0.9343	0.8689	0.7464	0.5602	0.3922	0.4390	0.6835	0.8897	0.9585	0.9782 (89)
MIT 2	18.1193	18.4008	18.8070	19.3425	19.7801	20.0183	20.0815	20.0732	19.9303	19.3877	18.6607	18.0467 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.3345	18.6054	18.9965	19.5139	19.9400	20.1763	20.2417	20.2326	20.0868	19.5562	18.8550	18.2646 (92)
Temperature adjustment												
adjusted MIT	18.1845	18.4554	18.8465	19.3639	19.7900	20.0263	20.0917	20.0826	19.9368	19.4062	18.7050	18.1146 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9631	0.9447	0.9155	0.8479	0.7304	0.5544	0.3916	0.4375	0.6711	0.8686	0.9430	0.9674 (94)
Useful gains	605.2989	668.4508	692.5574	698.6378	631.4142	473.3879	318.9318	333.2455	477.9874	563.4198	577.6504	583.9140 (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	1294.9226	1264.2289	1151.4890	975.9078	754.5094	506.0777	325.6490	343.4500	544.3649	821.2998	1082.3296	1297.7329 (97)
Space heating kWh	513.0800	400.3629	341.4451	199.6344	91.5828	0.0000	0.0000	0.0000	0.0000	191.8627	363.3690	531.0813 (98a)
Space heating requirement - total per year (kWh/year)	2632.4182											
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	513.0800	400.3629	341.4451	199.6344	91.5828	0.0000	0.0000	0.0000	0.0000	191.8627	363.3690	531.0813 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2632.4182											
Space heating per m2	(98c) / (4) = 27.7623 (99)											

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													88.7000 (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	513.0800	400.3629	341.4451	199.6344	91.5828	0.0000	0.0000	0.0000	0.0000	191.8627	363.3690	531.0813 (98)	
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)	
Space heating fuel (main heating system)	578.4442	451.3674	384.9437	225.0669	103.2501	0.0000	0.0000	0.0000	0.0000	216.3052	409.6607	598.7388 (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	225.3494	198.3550	208.4870	178.0970	169.0609	148.4487	143.7506	151.6861	155.7963	178.3596	195.2850	222.2197 (64)	
Efficiency of water heater	84.4713	84.1279	83.5067	82.3321	80.1698	76.2000	76.2000	76.2000	76.2000	82.2035	83.8895	76.2000 (216)	
Fuel for water heating, kWh/month	266.7764	235.7779	249.6651	216.3154	210.8787	194.8146	188.6490	199.0632	204.4570	216.9732	232.7883	262.6530 (217)	
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	11.2301	10.1433	11.2301	10.8678	11.2301	10.8678	11.2301	11.2301	10.8678	11.2301	10.8678	11.2301 (231)	
Lighting	31.2842	25.0974	22.5974	16.5558	12.7882	10.4481	11.6658	15.1637	19.6961	25.8423	29.1889	32.1537 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-35.4735	-52.0626	-77.9909	-90.5193	-99.2408	-93.1359	-91.8948	-85.9152	-75.2123	-60.8231	-39.6035	-30.3421 (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)	-17.4242	-38.6201	-81.8143	-129.7319	-176.8837	-179.6742	-176.7687	-146.3778	-102.6531	-56.6621	-23.6413	-13.5729 (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	2967.7770 (211)												
Space heating fuel - main system 2	0.0000 (213)												
Space heating fuel - secondary	0.0000 (215)												
Efficiency of water heater	76.2000												
Water heating fuel used	2678.8119 (219)												
Space cooling fuel	0.0000 (221)												

Electricity for pumps and fans:
(MEVDcentralised, Database: total watage = 5.7980, total flow = 37.0000, SFP = 0.1567)

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mechanical ventilation fans (SFP = 0.1567)	46.2249 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	132.2249 (231)
Electricity for lighting (calculated in Appendix L)	252.4815 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1976.0385 (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	4055.2568 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2967.7770	0.2100	623.2332 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2678.8119	0.2100	562.5505 (264)
Space and water heating			1185.7837 (265)
Pumps, fans and electric keep-hot	132.2249	0.1432	18.7295 (267)
Energy for lighting	252.4815	0.1490	37.6247 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-832.2140	0.1383	-115.0634
PV Unit electricity exported	-1143.8244	0.1245	-142.4392
Total			-257.5027 (269)
Total CO2, kg/year			984.6352 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.3800 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2967.7770	1.1300	3353.5880 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2678.8119	1.1300	3027.0574 (278)
Space and water heating			6380.6454 (279)
Pumps, fans and electric keep-hot	132.2249	1.5335	201.8160 (281)
Energy for lighting	252.4815	1.5547	392.5442 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-832.2140	1.5154	-1261.1767
PV Unit electricity exported	-1143.8244	0.4570	-522.7811
Total			-1783.9578 (283)
Total Primary energy kWh/year			5191.0478 (286)
Dwelling Primary energy Rate (DPER)			54.7500 (287)

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

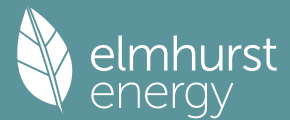
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	47.4100 (1b)	x 2.5000 (2b)	= 118.5250 (1b) - (3b)
First floor	47.4100 (1c)	x 2.6000 (2c)	= 123.2660 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	241.7910 (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) = 0.1241 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3741 (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) = 0.3180 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4054	0.3975	0.3895	0.3498	0.3418	0.3021	0.3021	0.2941	0.3180	0.3418	0.3577	0.3736 (22b)
	0.5822	0.5790	0.5759	0.5612	0.5584	0.5456	0.5456	0.5433	0.5506	0.5584	0.5640	0.5698 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.1600	1.0000	2.1600		(26)
TER Opening Type			13.7200	1.1450	15.7099		(27)
GF			47.4100	0.1300	6.1633		(28a)
Main	100.1640	15.8800	84.2840	0.1800	15.1711		(29a)
PIJ	47.4100		47.4100	0.1100	5.2151		(30)
Total net area of external elements Aum(A, m2)			194.9840				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.4194		(33)
Main dwelling							
Party Wall 1			43.6300	0.0000	0.0000		(32)

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

142.9752 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.5800	0.0500	0.5790
E3 Sill	11.5800	0.0500	0.5790
E4 Jamb	26.5200	0.0500	1.3260
E5 Ground floor (normal)	19.6400	0.1600	3.1424
E6 Intermediate floor within a dwelling	19.6400	0.0000	0.0000
E16 Corner (normal)	10.1900	0.0900	0.9171
E18 Party wall between dwellings	10.1900	0.0600	0.6114
P1 Party wall - Ground floor	8.5700	0.0800	0.6856
P4 Party wall - Roof (insulation at ceiling level)	8.5700	0.1200	1.0284
E10 Eaves (insulation at ceiling level)	11.0700	0.0600	0.6642
E12 Gable (insulation at ceiling level)	8.5700	0.0600	0.5142
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			10.0473 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	54.4667 (37)

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

(38)m	Jan 46.4524	Feb 46.1978	Mar 45.9482	Apr 44.7760	May 44.5567	Jun 43.5357	Jul 43.5357	Aug 43.3466	Sep 43.9290	Oct 44.5567	Nov 45.0004	Dec 45.4642 (38)
Heat transfer coeff	100.9191	100.6645	100.4150	99.2427	99.0234	98.0024	98.0024	97.8134	98.3957	99.0234	99.4671	99.9309 (39)
Average = Sum(39)m / 12 =												99.2417

HLP	Jan 1.0643	Feb 1.0616	Mar 1.0590	Apr 1.0466	May 1.0443	Jun 1.0336	Jul 1.0336	Aug 1.0316	Sep 1.0377	Oct 1.0443	Nov 1.0490	Dec 1.0539 (40)
HLP (average)												1.0466
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

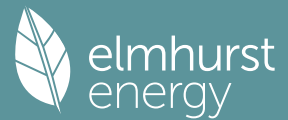
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6861 (42)
Hot water usage for mixer showers	69.2572	68.2164	66.6997	63.7979	61.6564	59.2683	57.9108	59.4160	61.0660	63.6301	66.5943	68.9918 (42a)
Hot water usage for baths	29.9061	29.4619	28.8365	27.6833	26.8197	25.8622	25.3450	25.9661	26.6424	27.6669	28.8439	29.8050 (42b)
Hot water usage for other uses	42.1386	40.6063	39.0739	37.5416	36.0093	34.4770	34.4770	36.0093	37.5416	39.0739	40.6063	42.1386 (42c)
Average daily hot water use (litres/day)												129.8883 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	141.3019	138.2846	134.6102	129.0228	124.4855	119.6075	117.7329	121.3914	125.2500	130.3710	136.0444	140.9354 (44)
Distribution loss (46)m = 0.15 x (45)m	223.7876	196.9154	206.8908	176.6258	167.5814	147.0714	142.3877	150.3080	154.4457	176.9122	193.8202	220.6708 (45)
	Total = Sum(45)m =										2157.4171	
Water storage loss:	33.5681	29.5373	31.0336	26.4939	25.1372	22.0607	21.3582	22.5462	23.1669	26.5368	29.0730	33.1006 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	274.7465	242.9428	257.8497	225.9408	218.5403	196.3865	193.3466	201.2669	203.7608	227.8711	243.1353	271.6297 (62)
WWHRS	-31.6615	-28.0017	-29.3218	-24.2796	-22.6277	-19.3627	-18.1494	-19.3001	-20.0334	-23.6171	-26.7553	-31.0752 (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	243.0850	214.9411	228.5280	201.6613	195.9126	177.0238	175.1972	181.9668	183.7274	204.2540	216.3800	240.5545 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =										2463.2317 (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) = Sum(64a)m =											0.0000 (64a)
Heat gains from water heating, kWh/month	87.1491	76.9812	81.5309	71.0568	68.4605	61.2300	60.0836	62.7171	63.6820	71.5630	76.7740	86.1128 (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	134.3061	134.3061	134.3061	134.3061	134.3061	134.3061	134.3061	134.3061	134.3061	134.3061	134.3061	134.3061 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.0665	147.3236	133.0665	137.5020	133.0665	137.5020	133.0665	133.0665	137.5020	133.0665	137.5020	133.0665 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	247.6715	250.2415	243.7651	229.9774	212.5731	196.2154	185.2875	182.7174	189.1939	202.9815	220.3859	236.7435 (68)

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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	36.4306	36.4306	36.4306	36.4306	36.4306	36.4306	36.4306	36.4306	36.4306	36.4306	36.4306	36.4306 (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)	-107.4449	-107.4449	-107.4449	-107.4449	-107.4449	-107.4449	-107.4449	-107.4449	-107.4449	-107.4449	-107.4449	-107.4449 (71)
Water heating gains (Table 5)	117.1359	114.5554	109.5846	98.6901	92.0169	85.0417	80.7576	84.2972	88.4472	96.1869	106.6306	115.7430 (72)
Total internal gains	564.1657	578.4124	552.7080	532.4614	503.9483	482.0510	462.4034	463.3730	478.4349	498.5267	530.8103	551.8448 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Southwest				4.6700	36.7938	0.6300	0.7000	0.7700	52.5126 (77)			
Southwest				1.4500	36.7938	0.6300	0.7000	0.7700	16.3048 (79)			
Northwest				7.6000	11.2829	0.6300	0.7000	0.7700	26.2064 (81)			
Solar gains	95.0238	170.5654	256.4964	356.5662	434.7575	447.1732	424.6475	363.9345	290.7759	194.7452	115.4018	80.2948 (83)
Total gains	659.1895	748.9778	809.2043	889.0276	938.7057	929.2241	887.0509	827.3075	769.2108	693.2719	646.2121	632.1397 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	37.3151	37.4095	37.5025	37.9454	38.0295	38.4257	38.4257	38.4999	38.2721	38.0295	37.8598	37.6841
alpha	3.4877	3.4940	3.5002	3.5297	3.5353	3.5617	3.5617	3.5667	3.5515	3.5353	3.5240	3.5123
util living area	0.9766	0.9626	0.9388	0.8792	0.7720	0.6101	0.4662	0.5137	0.7292	0.9033	0.9623	0.9796 (86)
MIT	19.1771	19.4241	19.7795	20.2627	20.6546	20.8935	20.9689	20.9560	20.7919	20.2896	19.6628	19.1401 (87)
Th 2	20.0301	20.0323	20.0345	20.0446	20.0466	20.0555	20.0555	20.0571	20.0520	20.0466	20.0427	20.0387 (88)
util rest of house	0.9722	0.9556	0.9270	0.8555	0.7275	0.5383	0.3740	0.4198	0.6643	0.8792	0.9541	0.9757 (89)
MIT 2	17.9042	18.2174	18.6649	19.2650	19.7222	19.9774	20.0399	20.0335	19.8831	19.3105	18.5296	17.8629 (90)
Living area fraction									FLA = Living area / (4) =			0.1803 (91)
MIT	18.1338	18.4350	18.8659	19.4449	19.8904	20.1426	20.2074	20.1998	20.0470	19.4870	18.7340	18.0932 (92)
Temperature adjustment												0.0000
adjusted MIT	18.1338	18.4350	18.8659	19.4449	19.8904	20.1426	20.2074	20.1998	20.0470	19.4870	18.7340	18.0932 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9601	0.9403	0.9089	0.8380	0.7194	0.5453	0.3894	0.4346	0.6639	0.8619	0.9390	0.9646 (94)
Useful gains	632.8811	704.2519	735.5066	744.9815	675.3088	506.6952	345.3852	359.5662	510.7060	597.4999	606.7677	609.7778 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1396.0921	1362.4936	1241.7259	1046.5032	811.0369	543.1872	353.5373	371.6741	585.1594	880.0257	1157.1979	1388.3616 (97)
Space heating kWh	567.8290	442.3384	376.6272	217.0956	100.9817	0.0000	0.0000	0.0000	0.0000	210.1992	396.3097	579.2664 (98a)
Space heating requirement - total per year (kWh/year)												2890.6472
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	567.8290	442.3384	376.6272	217.0956	100.9817	0.0000	0.0000	0.0000	0.0000	210.1992	396.3097	579.2664 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2890.6472
Space heating per m2										(98c) / (4) =		30.4856 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (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
	567.8290	442.3384	376.6272	217.0956	100.9817	0.0000	0.0000	0.0000	0.0000	210.1992	396.3097	579.2664 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	614.5335	478.7212	407.6052	234.9520	109.2876	0.0000	0.0000	0.0000	0.0000	227.4883	428.9066	626.9117 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	243.0850	214.9411	228.5280	201.6613	195.9126	177.0238	175.1972	181.9668	183.7274	204.2540	216.3800	240.5545 (64)
Efficiency of water heater (217)m	86.1347	85.8918	85.4443	84.5398	83.0320	80.3000	80.3000	80.3000	80.3000	84.4430	85.6601	80.3000 (216)
Fuel for water heating, kWh/month	282.2150	250.2463	267.4585	238.5400	235.9483	220.4530	218.1783	226.6087	228.8013	241.8838	252.6031	279.0933 (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	27.6486	22.1807	19.9713	14.6318	11.3020	9.2339	10.3101	13.4015	17.4072	22.8391	25.7968	28.4170 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-43.6262	-61.1261	-87.3135	-97.5169	-104.5764	-97.3718	-96.1401	-91.0328	-81.9469	-69.5695	-47.8171	-37.7597 (233a)

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Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-25.7914	-54.1297	-107.3705	-160.9638	-212.5654	-213.5113	-211.0240	-178.8145	-131.2362	-77.3387	-34.4087	-20.4067	(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												3128.4060	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2942.0297	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												223.1400	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2343.3580	(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												4036.2177	(238)

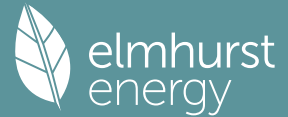
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3128.4060	0.2100	656.9653 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2942.0297	0.2100	617.8262 (264)
Space and water heating			1274.7915 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	223.1400	0.1443	32.2060 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-915.7971	0.1347	-123.3852
PV Unit electricity exported	-1427.5610	0.1259	-179.7981
Total			-303.1833 (269)
Total CO2, kg/year			1015.7434 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.7100 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3128.4060	1.1300	3535.0988 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2942.0297	1.1300	3324.4936 (278)
Space and water heating			6859.5924 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	223.1400	1.5338	342.2595 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-915.7971	1.4979	-1371.8155
PV Unit electricity exported	-1427.5610	0.4623	-659.9855
Total			-2031.8010 (283)
Total Primary energy kWh/year			5300.1517 (286)
Target Primary Energy Rate (TPER)			55.9000 (287)

Full SAP Calculation Printout



Property Reference	HT09-Semi			Issued on Date	07/05/2025
Assessment Reference	001	Prop Type Ref			
Property	Highmoor Lane, CLECKHEATON, BD19 6LW				
SAP Rating	94 A	DER	10.38	TER	10.71
Environmental	91 B	% DER < TER			3.08
CO ₂ Emissions (t/year)	0.97	DFEE	35.00	TFEE	35.61
Compliance Check	See BREL	% DFEE < TFEE			1.71
% DPER < TPER	2.06	DPER	54.75	TPER	55.90
Assessor Details	Mr. Paul Goddard			Assessor ID	B342-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	47.4100 (1b)	x 2.5000 (2b)	= 118.5250 (1b) - (3b)
First floor	47.4100 (1c)	x 2.6000 (2c)	= 123.2660 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 241.7910 (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) = 0.1241 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3241 (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) = 0.2755 (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	0.3512	0.3443	0.3374	0.3030	0.2961	0.2617	0.2617	0.2548	0.2755	0.2961	0.3099	0.3237 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5617	0.5593	0.5569	0.5459	0.5438	0.5342	0.5342	0.5325	0.5379	0.5438	0.5480	0.5524 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			2.1600	1.0000	2.1600		(26)
Window			10.3900	1.1450	11.8969		(27)
Patio Door			3.3300	1.3258	4.4148		(27)
GF			47.4100	0.1100	5.2151	9.0000	426.6900 (28a)
Main	100.1640	15.8800	84.2840	0.1800	15.1711	18.0000	1517.1119 (29a)
PIJ	47.4100		47.4100	0.0900	4.2669	9.0000	426.6900 (30)
Total net area of external elements Aum(A, m ²)			194.9840				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 43.1248		(33)
Main dwelling							
Party Wall 1			43.6300	0.0000	0.0000	20.0000	872.6000 (32)
Internal Wall 1			120.4500			75.0000	9033.7498 (32c)
Internal Floor 1			47.4100			18.0000	853.3800 (32d)
Internal Ceiling 1			47.4100			9.0000	426.6900 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 13556.9117 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							142.9752 (35)
List of Thermal Bridges							

K1 Element										Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)										11.5800	0.0500	0.5790	
E3 Sill										11.5800	0.0500	0.5790	
E4 Jamb										26.5200	0.0500	1.3260	
E5 Ground floor (normal)										19.6400	0.1000	1.9640	
E6 Intermediate floor within a dwelling										19.6400	0.0700	1.3748	
E16 Corner (normal)										10.1900	0.0900	0.9171	
E18 Party wall between dwellings										10.1900	0.0600	0.6114	
P1 Party wall - Ground floor										8.5700	0.0800	0.6856	
P4 Party wall - Roof (insulation at ceiling level)										8.5700	0.1200	1.0284	
E10 Eaves (insulation at ceiling level)										11.0700	0.0600	0.6642	
E12 Gable (insulation at ceiling level)										8.5700	0.0600	0.5142	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)													10.2437 (36)
Point Thermal bridges												(36a) =	0.0000
Total fabric heat loss											(33) + (36) + (36a) =		53.3685 (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	44.8167	44.6256	44.4383	43.5585	43.3939	42.6276	42.6276	42.4857	42.9228	43.3939	43.7269	44.0750	(38)
Average = Sum(39)m / 12 =	98.1853	97.9942	97.8068	96.9270	96.7624	95.9962	95.9962	95.8543	96.2913	96.7624	97.0954	97.4436	(39)
												96.9263	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0355	1.0335	1.0315	1.0222	1.0205	1.0124	1.0124	1.0109	1.0155	1.0205	1.0240	1.0277	(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													2.6861 (42)
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	29.9061	29.4619	28.8365	27.6833	26.8197	25.8622	25.3450	25.9661	26.6424	27.6669	28.8439	29.8050	(42b)
Hot water usage for other uses													
	42.1386	40.6063	39.0739	37.5416	36.0093	34.4770	34.4770	36.0093	37.5416	39.0739	40.6063	42.1386	(42c)
Average daily hot water use (litres/day)													66.0354 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	72.0447	70.0682	67.9104	65.2249	62.8291	60.3393	59.8221	61.9754	64.1840	66.7409	69.4502	71.9436	(44)
Energy conte	114.1011	99.7762	104.3758	89.2896	84.5800	74.1941	72.3496	76.7385	79.1453	90.5667	98.9445	112.6462	(45)
Energy content (annual)										Total = Sum(45)m =		1096.7078	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	96.9860	84.8098	88.7194	75.8962	71.8930	63.0650	61.4972	65.2278	67.2735	76.9817	84.1028	95.7493	(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													
	96.9860	84.8098	88.7194	75.8962	71.8930	63.0650	61.4972	65.2278	67.2735	76.9817	84.1028	95.7493	(64)

Full SAP Calculation Printout



Total gains 576.1985 656.5483 708.4281 783.1266 827.8632 824.7878 788.3844 733.6716 681.6401 610.0744 567.1524 552.2538 (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	38.3541	38.4289	38.5025	38.8520	38.9181	39.2287	39.2287	39.2868	39.1085	38.9181	38.7846	38.6460
alpha	3.5569	3.5619	3.5668	3.5901	3.5945	3.6152	3.6152	3.6191	3.6072	3.5945	3.5856	3.5764
util living area	0.9841	0.9738	0.9561	0.9076	0.8137	0.6567	0.5082	0.5590	0.7728	0.9276	0.9736	0.9863 (86)
MIT	19.1074	19.3433	19.6912	20.1816	20.5991	20.8708	20.9613	20.9453	20.7558	20.2195	19.5883	19.0682 (87)
Th 2	20.0539	20.0555	20.0572	20.0649	20.0663	20.0730	20.0730	20.0743	20.0704	20.0663	20.0634	20.0603 (88)
util rest of house	0.9811	0.9688	0.9472	0.8881	0.7735	0.5853	0.4118	0.4619	0.7120	0.9083	0.9677	0.9836 (89)
MIT 2	18.3220	18.5564	18.9002	19.3800	19.7665	19.9972	20.0575	20.0506	19.9115	19.4251	18.8067	18.2879 (90)
Living area fraction	18.4636	18.6983	19.0428	19.5246	19.9167	20.1548	20.2205	20.2120	20.0637	19.5684	18.9477	18.4286 (91)
MIT	18.4636	18.6983	19.0428	19.5246	19.9167	20.1548	20.2205	20.2120	20.0637	19.5684	18.9477	18.4286 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4636	18.6983	19.0428	19.5246	19.9167	20.1548	20.2205	20.2120	20.0637	19.5684	18.9477	18.4286 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9740	0.9592	0.9351	0.8747	0.7663	0.5920	0.4278	0.4771	0.7115	0.8956	0.9582	0.9773 (94)
Useful gains	561.2338	629.7934	662.4582	685.0277	634.3654	488.2831	337.2602	350.0639	484.9891	546.4102	543.4538	539.7160 (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	1390.6609	1352.1576	1226.7755	1029.8081	795.0639	533.2360	347.5541	365.3918	574.2553	867.8034	1150.3538	1386.4898 (97)
Space heating kWh	617.0938	485.4288	419.8521	248.2419	119.5597	0.0000	0.0000	0.0000	0.0000	239.1165	436.9680	629.9997 (98a)
Space heating requirement - total per year (kWh/year)												3196.2604
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	617.0938	485.4288	419.8521	248.2419	119.5597	0.0000	0.0000	0.0000	0.0000	239.1165	436.9680	629.9997 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3196.2604
Space heating per m2												33.7087 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	902.3639	710.3716	728.4924	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7846	0.8533	0.8205	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	708.0303	606.1759	597.7592	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	905.3971	865.6405	804.3764	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	142.1041	193.0417	153.7232	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	35.5260	48.2604	38.4308	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												122.2172 (107)
Energy for space heating												33.7087 (99)
Energy for space cooling												1.2889 (108)
Total												34.9977 (109)
Fabric Energy Efficiency (DFEE)												35.0 (109)

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

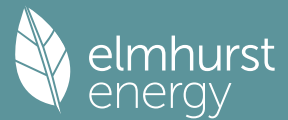
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	47.4100 (1b)	x 2.5000 (2b)	= 118.5250 (1b) - (3b)
First floor	47.4100 (1c)	x 2.6000 (2c)	= 123.2660 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 241.7910 (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)

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Number of intermittent extract fans 3 * 10 = 30.0000 (7a)
Number of passive vents 0 * 10 = 0.0000 (7b)
Number of flueless gas fires 0 * 40 = 0.0000 (7c)

Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 30.0000 / (5) = 0.1241 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 5.0000 (17)
Infiltration rate 0.3741 (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) = 0.3180 (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	0.4054	0.3975	0.3895	0.3498	0.3418	0.3021	0.3021	0.2941	0.3180	0.3418	0.3577	0.3736 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5822	0.5790	0.5759	0.5612	0.5584	0.5456	0.5456	0.5433	0.5506	0.5584	0.5640	0.5698 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.1600	1.0000	2.1600		(26)
TER Opening Type			13.7200	1.1450	15.7099		(27)
GF			47.4100	0.1300	6.1633		(28a)
Main	100.1640	15.8800	84.2840	0.1800	15.1711		(29a)
PIJ	47.4100		47.4100	0.1100	5.2151		(30)
Total net area of external elements Aum (A, m2)			194.9840				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 44.4194		(33)
Main dwelling							
Party Wall 1			43.6300	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							142.9752 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				11.5800	0.0500	0.5790	
E3 Sill				11.5800	0.0500	0.5790	
E4 Jamb				26.5200	0.0500	1.3260	
E5 Ground floor (normal)				19.6400	0.1600	3.1424	
E6 Intermediate floor within a dwelling				19.6400	0.0000	0.0000	
E16 Corner (normal)				10.1900	0.0900	0.9171	
E18 Party wall between dwellings				10.1900	0.0600	0.6114	
P1 Party wall - Ground floor				8.5700	0.0800	0.6856	
P4 Party wall - Roof (insulation at ceiling level)				8.5700	0.1200	1.0284	
E10 Eaves (insulation at ceiling level)				11.0700	0.0600	0.6642	
E12 Gable (insulation at ceiling level)				8.5700	0.0600	0.5142	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.0473 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	54.4667 (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	46.4524	46.1978	45.9482	44.7760	44.5567	43.5357	43.5357	43.3466	43.9290	44.5567	45.0004	45.4642 (38)
Heat transfer coeff	100.9191	100.6645	100.4150	99.2427	99.0234	98.0024	98.0024	97.8134	98.3957	99.0234	99.4671	99.9309 (39)
Average = Sum(39)m / 12 =												99.2417

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0643	1.0616	1.0590	1.0466	1.0443	1.0336	1.0336	1.0316	1.0377	1.0443	1.0490	1.0539 (40)
HLP (average)												1.0466
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6861 (42)

Hot water usage for mixer showers 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (42a)

Hot water usage for baths 29.9061 29.4619 28.8365 27.6833 26.8197 25.8622 25.3450 25.9661 26.6424 27.6669 28.8439 29.8050 (42b)

Hot water usage for other uses 42.1386 40.6063 39.0739 37.5416 36.0093 34.4770 34.4770 36.0093 37.5416 39.0739 40.6063 42.1386 (42c)

Average daily hot water use (litres/day) 66.0354 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	72.0447	70.0682	67.9104	65.2249	62.8291	60.3393	59.8221	61.9754	64.1840	66.7409	69.4502	71.9436 (44)
Energy conte	114.1011	99.7762	104.3758	89.2896	84.5800	74.1941	72.3496	76.7385	79.1453	90.5667	98.9445	112.6462 (45)
Energy content (annual)										Total = Sum(45)m =		1096.7078
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	96.9860	84.8098	88.7194	75.8962	71.8930	63.0650	61.4972	65.2278	67.2735	76.9817	84.1028	95.7493 (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	96.9860	84.8098	88.7194	75.8962	71.8930	63.0650	61.4972	65.2278	67.2735	76.9817	84.1028	95.7493 (64)
Total per year (kWh/year) = Sum(64)m =												932.2016 (64)
12Total per year (kWh/year)												932 (64)

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Electric shower(s)	55.4635	49.4184	53.9630	51.4962	52.4626	50.0442	51.7123	52.4626	51.4962	53.9630	52.9483	55.4635 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												630.8938 (64a)
Heat gains from water heating, kWh/month	38.1124	33.5570	35.6706	31.8481	31.0889	28.2773	28.3024	29.4226	29.6924	32.7362	34.2628	37.8032 (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	134.3061	134.3061	134.3061	134.3061	134.3061	134.3061	134.3061	134.3061	134.3061	134.3061	134.3061	134.3061	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.0665	147.3236	133.0665	137.5020	133.0665	137.5020	133.0665	133.0665	137.5020	133.0665	137.5020	133.0665	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	247.6715	250.2415	243.7651	229.9774	212.5731	196.2154	185.2875	182.7174	189.1939	202.9815	220.3859	236.7435	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.4306	36.4306	36.4306	36.4306	36.4306	36.4306	36.4306	36.4306	36.4306	36.4306	36.4306	36.4306	(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)	-107.4449	-107.4449	-107.4449	-107.4449	-107.4449	-107.4449	-107.4449	-107.4449	-107.4449	-107.4449	-107.4449	-107.4449	(71)
Water heating gains (Table 5)	51.2263	49.9361	47.9444	44.2335	41.7861	39.2740	38.0408	39.5465	41.2395	44.0002	47.5872	50.8107	(72)
Total internal gains	495.2561	510.7930	488.0677	475.0048	450.7175	436.2833	419.6866	418.6222	431.2273	443.3401	468.7669	483.9126	(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	
Southeast				4.6700	36.7938		0.6300	0.7000		0.7700		52.5126 (77)	
Southwest				1.4500	36.7938		0.6300	0.7000		0.7700		16.3048 (79)	
Northwest				7.6000	11.2829		0.6300	0.7000		0.7700		26.2064 (81)	
Solar gains	95.0238	170.5654	256.4964	356.5662	434.7575	447.1732	424.6475	363.9345	290.7759	194.7452	115.4018	80.2948 (83)	
Total gains	590.2799	681.3585	744.5641	831.5710	885.4750	883.4565	844.3341	782.5567	722.0031	638.0853	584.1688	564.2074 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	37.3151	37.4095	37.5025	37.9454	38.0295	38.4257	38.4257	38.4999	38.2721	38.0295	37.8598	37.6841	
alpha	3.4877	3.4940	3.5002	3.5297	3.5353	3.5617	3.5617	3.5667	3.5515	3.5353	3.5240	3.5123	
util living area	0.9831	0.9713	0.9509	0.8963	0.7945	0.6330	0.4868	0.5381	0.7557	0.9210	0.9717	0.9855	(86)
MIT	19.0660	19.3206	19.6889	20.1988	20.6174	20.8800	20.9643	20.9490	20.7649	20.2217	19.5675	19.0291	(87)
Th 2	20.0301	20.0323	20.0345	20.0446	20.0466	20.0555	20.0555	20.0571	20.0520	20.0466	20.0427	20.0387	(88)
util rest of house	0.9798	0.9658	0.9410	0.8750	0.7519	0.5607	0.3917	0.4415	0.6926	0.9002	0.9653	0.9827	(89)
MIT 2	18.2640	18.5169	18.8804	19.3790	19.7637	19.9862	20.0414	20.0355	19.9010	19.4111	18.7710	18.2336	(90)
Living area fraction	18.4087	18.6618	19.0262	19.5269	19.9177	20.1474	20.2078	20.2002	20.0568	19.5573	18.9147	18.3771	(91)
MIT	18.4087	18.6618	19.0262	19.5269	19.9177	20.1474	20.2078	20.2002	20.0568	19.5573	18.9147	18.3771	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4087	18.6618	19.0262	19.5269	19.9177	20.1474	20.2078	20.2002	20.0568	19.5573	18.9147	18.3771	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	573.9391	651.0967	691.0260	716.2411	660.1017	502.0119	344.1446	357.5227	500.2924	566.0164	558.0435	550.6132	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1423.8332	1385.3298	1257.8214	1054.6405	813.7400	543.6547	353.5781	371.7127	586.1273	886.9815	1175.1695	1416.7263	(97)
Space heating kWh	632.3212	493.4047	421.6957	243.6475	114.3069	0.0000	0.0000	0.0000	0.0000	238.7980	444.3307	644.3881	(98a)
Space heating requirement - total per year (kWh/year)												3232.8930	
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	632.3212	493.4047	421.6957	243.6475	114.3069	0.0000	0.0000	0.0000	0.0000	238.7980	444.3307	644.3881	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3232.8930	
Space heating per m ²												34.0951	(99)

8c. Space cooling requirement

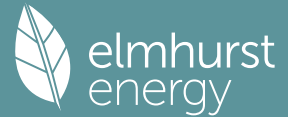
Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	921.2230	725.2181	743.3817	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8020	0.8665	0.8347	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	738.8069	628.3908	620.4667	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	973.9709	931.0362	861.5149	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	169.3181	225.1682	179.3399	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fc = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	42.3295	56.2921	44.8350	0.0000	0.0000	0.0000	0.0000	(107)

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Space cooling requirement	143.4565 (107)
Energy for space heating	34.0951 (99)
Energy for space cooling	1.5129 (108)
Total	35.6080 (109)
Fabric Energy Efficiency (TFEE)	35.6 (109)

Full SAP Calculation Printout



Property Reference	HT09-Semi			Issued on Date	07/05/2025
Assessment Reference	001	Prop Type Ref			
Property	Highmoor Lane, CLECKHEATON, BD19 6LW				
SAP Rating	94 A	DER	10.38	TER	10.71
Environmental	91 B	% DER < TER			3.08
CO ₂ Emissions (t/year)	0.97	DFEE	35.00	TFEE	35.61
Compliance Check	See BREL	% DFEE < TFEE			1.71
% DPER < TPER	2.06	DPER	54.75	TPER	55.90
Assessor Details	Mr. Paul Goddard			Assessor ID	B342-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	47.4100 (1b)	x 2.5000 (2b)	= 118.5250 (1b) - (3b)
First floor	47.4100 (1c)	x 2.6000 (2c)	= 123.2660 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 241.7910 (5)

2. Ventilation rate

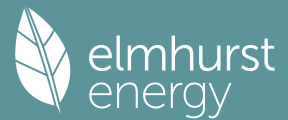
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.2000 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1700 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			2.1600	1.0000	2.1600		(26)
Window			10.3900	1.1450	11.8969		(27)
Patio Door			3.3300	1.3258	4.4148		(27)
GF			47.4100	0.1100	5.2151	9.0000	426.6900 (28a)
Main	100.1640	15.8800	84.2840	0.1800	15.1711	18.0000	1517.1119 (29a)
PIJ	47.4100		47.4100	0.0900	4.2669	9.0000	426.6900 (30)
Total net area of external elements Aum(A, m ²)			194.9840				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.1248		(33)
Main dwelling							
Party Wall 1			43.6300	0.0000	0.0000	20.0000	872.6000 (32)
Internal Wall 1			120.4500			75.0000	9033.7498 (32c)
Internal Floor 1			47.4100			18.0000	853.3800 (32d)
Internal Ceiling 1			47.4100			9.0000	426.6900 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13556.9117 (34)

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Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												142.9752 (35)
List of Thermal Bridges												
K1 Element												
E2 Other lintels (including other steel lintels)												
E3 Sill												
E4 Jamb												
E5 Ground floor (normal)												
E6 Intermediate floor within a dwelling												
E16 Corner (normal)												
E18 Party wall between dwellings												
P1 Party wall - Ground floor												
P4 Party wall - Roof (insulation at ceiling level)												
E10 Eaves (insulation at ceiling level)												
E12 Gable (insulation at ceiling level)												
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												10.2437 (36)
Point Thermal bridges												0.0000
Total fabric heat loss												(33) + (36) + (36a) = 53.3685 (37)

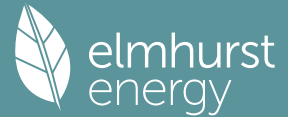
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	39.8955	39.8955	39.8955	39.8955	39.8955	39.8955	39.8955	39.8955	39.8955	39.8955	39.8955	39.8955
Average = Sum(39)m / 12 =	93.2641	93.2641	93.2641	93.2641	93.2641	93.2641	93.2641	93.2641	93.2641	93.2641	93.2641	93.2641
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9836	0.9836	0.9836	0.9836	0.9836	0.9836	0.9836	0.9836	0.9836	0.9836	0.9836	0.9836
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.6861 (42)
Hot water usage for mixer showers												
Hot water usage for baths												
Hot water usage for other uses												
Average daily hot water use (litres/day)												129.8883 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	141.3019	138.2846	134.6102	129.0228	124.4855	119.6075	117.7329	121.3914	125.2500	130.3710	136.0444	140.9354
Energy content (annual)	223.7876	196.9154	206.8908	176.6258	167.5814	147.0714	142.3877	150.3080	154.4457	176.9122	193.8202	220.6708
Distribution loss (46)m = 0.15 x (45)m												2157.4171
Water storage loss:												
Total storage loss												
If cylinder contains dedicated solar storage												
Primary loss												
Combi loss												
Total heat required for water heating calculated for each month												
WWHRS												
FV diverter												
Solar input												
FGHRS												
Output from w/h												
12Total per year (kWh/year)												
Electric shower(s)												
Heat gains from water heating, kWh/month												

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
Pumps, fans												
Losses e.g. evaporation (negative values) (Table 5)												
Water heating gains (Table 5)												
Total internal gains												

6. Solar gains												
[Jan]												
Area												
Solar flux												
Specific data												
Specific data												
Access factor												
Gains W												
Southeast												
Southwest												
Northwest												
Northwest												

Full SAP Calculation Printout



Solar gains	80.9424	145.7552	220.3603	308.1218	377.1457	388.5045	368.6978	315.0493	250.4129	166.7343	98.3854	68.3412 (83)
Total gains	628.5096	707.5799	756.4813	823.9707	864.4678	853.9104	814.4358	761.7621	712.1934	648.6240	612.5810	603.5832 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	40.3779	40.3779	40.3779	40.3779	40.3779	40.3779	40.3779	40.3779	40.3779	40.3779	40.3779	40.3779	
alpha	3.6919	3.6919	3.6919	3.6919	3.6919	3.6919	3.6919	3.6919	3.6919	3.6919	3.6919	3.6919	
util living area	0.9788	0.9661	0.9448	0.8905	0.7882	0.6301	0.4831	0.5315	0.7453	0.9116	0.9659	0.9816 (86)	
MIT	19.3124	19.5351	19.8581	20.2930	20.6669	20.8946	20.9698	20.9568	20.7981	20.3219	19.7379	19.2550 (87)	
Th 2	20.0970	20.0970	20.0970	20.0970	20.0970	20.0970	20.0970	20.0970	20.0970	20.0970	20.0970	20.0970 (88)	
util rest of house	0.9748	0.9599	0.9343	0.8689	0.7464	0.5602	0.3922	0.4390	0.6835	0.8897	0.9585	0.9782 (89)	
MIT 2	18.1193	18.4008	18.8070	19.3425	19.7801	20.0183	20.0815	20.0732	19.9303	19.3877	18.6607	18.0467 (90)	
Living area fraction	fLA = Living area / (4) =												0.1803 (91)
MIT	18.3345	18.6054	18.9965	19.5139	19.9400	20.1763	20.2417	20.2326	20.0868	19.5562	18.8550	18.2646 (92)	
Temperature adjustment													-0.1500
adjusted MIT	18.1845	18.4554	18.8465	19.3639	19.7900	20.0263	20.0917	20.0826	19.9368	19.4062	18.7050	18.1146 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9631	0.9447	0.9155	0.8479	0.7304	0.5544	0.3916	0.4375	0.6711	0.8686	0.9430	0.9674 (94)
Useful gains	605.2989	668.4508	692.5574	698.6378	631.4142	473.3879	318.9318	333.2455	477.9874	563.4198	577.6504	583.9140 (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	1294.9226	1264.2289	1151.4890	975.9078	754.5094	506.0777	325.6490	343.4500	544.3649	821.2998	1082.3296	1297.7329 (97)
Space heating kWh	513.0800	400.3629	341.4451	199.6344	91.5828	0.0000	0.0000	0.0000	0.0000	191.8627	363.3690	531.0813 (98a)
Space heating requirement - total per year (kWh/year)												2632.4182
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	513.0800	400.3629	341.4451	199.6344	91.5828	0.0000	0.0000	0.0000	0.0000	191.8627	363.3690	531.0813 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2632.4182
Space heating per m2	(98c) / (4) =											27.7623 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)	
Fraction of space heat from main system(s)												1.0000 (202)	
Efficiency of main space heating system 1 (in %)												88.7000 (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	513.0800	400.3629	341.4451	199.6344	91.5828	0.0000	0.0000	0.0000	0.0000	191.8627	363.3690	531.0813 (98)	
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)	
Space heating fuel (main heating system)	578.4442	451.3674	384.9437	225.0669	103.2501	0.0000	0.0000	0.0000	0.0000	216.3052	409.6607	598.7388 (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	225.3494	198.3550	208.4870	178.0970	169.0609	148.4487	143.7506	151.6861	155.7963	178.3596	195.2850	222.2197 (64)	
Efficiency of water heater (217)m	84.4713	84.1279	83.5067	82.3321	80.1698	76.2000	76.2000	76.2000	76.2000	82.2035	83.8895	76.2000 (216)	
Fuel for water heating, kWh/month	266.7764	235.7779	249.6651	216.3154	210.8787	194.8146	188.6490	199.0632	204.4570	216.9732	232.7883	262.6530 (217)	
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	11.2301	10.1433	11.2301	10.8678	11.2301	10.8678	11.2301	11.2301	10.8678	11.2301	10.8678	11.2301 (231)	
Lighting	31.2842	25.0974	22.5974	16.5558	12.7882	10.4481	11.6658	15.1637	19.6961	25.8423	29.1889	32.1537 (232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-35.4735	-52.0626	-77.9909	-90.5193	-99.2408	-93.1359	-91.8948	-85.9152	-75.2123	-60.8231	-39.6035	-30.3421 (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	-17.4242	-38.6201	-81.8143	-129.7319	-176.8837	-179.6742	-176.7687	-146.3778	-102.6531	-56.6621	-23.6413	-13.5729 (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													2967.7770 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													76.2000
Water heating fuel used													2678.8119 (219)
Space cooling fuel													0.0000 (221)

Electricity for pumps and fans:
(MEVDcentralised, Database: total watage = 5.7980, total flow = 37.0000, SFP = 0.1567)

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mechanical ventilation fans (SFP = 0.1567)	46.2249 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	132.2249 (231)
Electricity for lighting (calculated in Appendix L)	252.4815 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1976.0385 (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	4055.2568 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2967.7770	0.2100	623.2332 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2678.8119	0.2100	562.5505 (264)
Space and water heating			1185.7837 (265)
Pumps, fans and electric keep-hot	132.2249	0.1432	18.7295 (267)
Energy for lighting	252.4815	0.1490	37.6247 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-832.2140	0.1383	-115.0634
PV Unit electricity exported	-1143.8244	0.1245	-142.4392
Total			-257.5027 (269)
Total CO2, kg/year			984.6352 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.3800 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2967.7770	1.1300	3353.5880 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2678.8119	1.1300	3027.0574 (278)
Space and water heating			6380.6454 (279)
Pumps, fans and electric keep-hot	132.2249	1.5335	201.8160 (281)
Energy for lighting	252.4815	1.5547	392.5442 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-832.2140	1.5154	-1261.1767
PV Unit electricity exported	-1143.8244	0.4570	-522.7811
Total			-1783.9578 (283)
Total Primary energy kWh/year			5191.0478 (286)
Dwelling Primary energy Rate (DPER)			54.7500 (287)

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

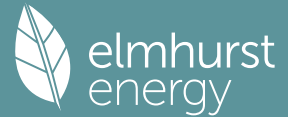
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	47.4100 (1b)	x 2.5000 (2b)	= 118.5250 (1b) - (3b)
First floor	47.4100 (1c)	x 2.6000 (2c)	= 123.2660 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	241.7910 (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) = 0.1241 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3741 (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) = 0.3180 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4054	0.3975	0.3895	0.3498	0.3418	0.3021	0.3021	0.2941	0.3180	0.3418	0.3577	0.3736 (22b)
	0.5822	0.5790	0.5759	0.5612	0.5584	0.5456	0.5456	0.5433	0.5506	0.5584	0.5640	0.5698 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.1600	1.0000	2.1600		(26)
TER Opening Type			13.7200	1.1450	15.7099		(27)
GF			47.4100	0.1300	6.1633		(28a)
Main	100.1640	15.8800	84.2840	0.1800	15.1711		(29a)
PIJ	47.4100		47.4100	0.1100	5.2151		(30)
Total net area of external elements Aum(A, m2)			194.9840				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.4194		(33)
Main dwelling							
Party Wall 1			43.6300	0.0000	0.0000		(32)

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

142.9752 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.5800	0.0500	0.5790
E3 Sill	11.5800	0.0500	0.5790
E4 Jamb	26.5200	0.0500	1.3260
E5 Ground floor (normal)	19.6400	0.1600	3.1424
E6 Intermediate floor within a dwelling	19.6400	0.0000	0.0000
E16 Corner (normal)	10.1900	0.0900	0.9171
E18 Party wall between dwellings	10.1900	0.0600	0.6114
P1 Party wall - Ground floor	8.5700	0.0800	0.6856
P4 Party wall - Roof (insulation at ceiling level)	8.5700	0.1200	1.0284
E10 Eaves (insulation at ceiling level)	11.0700	0.0600	0.6642
E12 Gable (insulation at ceiling level)	8.5700	0.0600	0.5142

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

10.0473 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 54.4667 (37)

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

(38)m	Jan 46.4524	Feb 46.1978	Mar 45.9482	Apr 44.7760	May 44.5567	Jun 43.5357	Jul 43.5357	Aug 43.3466	Sep 43.9290	Oct 44.5567	Nov 45.0004	Dec 45.4642 (38)
Heat transfer coeff	100.9191	100.6645	100.4150	99.2427	99.0234	98.0024	98.0024	97.8134	98.3957	99.0234	99.4671	99.9309 (39)
Average = Sum(39)m / 12 =												99.2417

HLP	Jan 1.0643	Feb 1.0616	Mar 1.0590	Apr 1.0466	May 1.0443	Jun 1.0336	Jul 1.0336	Aug 1.0316	Sep 1.0377	Oct 1.0443	Nov 1.0490	Dec 1.0539 (40)
HLP (average)												1.0466
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

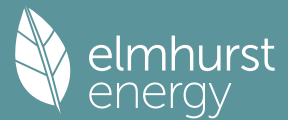
Assumed occupancy											2.6861 (42)	
Hot water usage for mixer showers	69.2572	68.2164	66.6997	63.7979	61.6564	59.2683	57.9108	59.4160	61.0660	63.6301	66.5943	68.9918 (42a)
Hot water usage for baths	29.9061	29.4619	28.8365	27.6833	26.8197	25.8622	25.3450	25.9661	26.6424	27.6669	28.8439	29.8050 (42b)
Hot water usage for other uses	42.1386	40.6063	39.0739	37.5416	36.0093	34.4770	34.4770	36.0093	37.5416	39.0739	40.6063	42.1386 (42c)
Average daily hot water use (litres/day)												129.8883 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	141.3019	138.2846	134.6102	129.0228	124.4855	119.6075	117.7329	121.3914	125.2500	130.3710	136.0444	140.9354 (44)
Energy conte	223.7876	196.9154	206.8908	176.6258	167.5814	147.0714	142.3877	150.3080	154.4457	176.9122	193.8202	220.6708 (45)
Energy content (annual)										Total = Sum(45)m =		2157.4171
Distribution loss (46)m = 0.15 x (45)m	33.5681	29.5373	31.0336	26.4939	25.1372	22.0607	21.3582	22.5462	23.1669	26.5368	29.0730	33.1006 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	274.7465	242.9428	257.8497	225.9408	218.5403	196.3865	193.3466	201.2669	203.7608	227.8711	243.1353	271.6297 (62)
WWHRS	-31.6615	-28.0017	-29.3218	-24.2796	-22.6277	-19.3627	-18.1494	-19.3001	-20.0334	-23.6171	-26.7553	-31.0752 (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	243.0850	214.9411	228.5280	201.6613	195.9126	177.0238	175.1972	181.9668	183.7274	204.2540	216.3800	240.5545 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2463.2317 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												0.0000 (64a)
Heat gains from water heating, kWh/month	87.1491	76.9812	81.5309	71.0568	68.4605	61.2300	60.0836	62.7171	63.6820	71.5630	76.7740	86.1128 (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	134.3061	134.3061	134.3061	134.3061	134.3061	134.3061	134.3061	134.3061	134.3061	134.3061	134.3061	134.3061 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	133.0665	147.3236	133.0665	137.5020	133.0665	137.5020	133.0665	133.0665	137.5020	133.0665	137.5020	133.0665 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	247.6715	250.2415	243.7651	229.9774	212.5731	196.2154	185.2875	182.7174	189.1939	202.9815	220.3859	236.7435 (68)

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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	36.4306	36.4306	36.4306	36.4306	36.4306	36.4306	36.4306	36.4306	36.4306	36.4306	36.4306	36.4306 (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)	-107.4449	-107.4449	-107.4449	-107.4449	-107.4449	-107.4449	-107.4449	-107.4449	-107.4449	-107.4449	-107.4449	-107.4449 (71)
Water heating gains (Table 5)	117.1359	114.5554	109.5846	98.6901	92.0169	85.0417	80.7576	84.2972	88.4472	96.1869	106.6306	115.7430 (72)
Total internal gains	564.1657	578.4124	552.7080	532.4614	503.9483	482.0510	462.4034	463.3730	478.4349	498.5267	530.8103	551.8448 (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				
Southeast				4.6700	36.7938	0.6300	0.7000	0.7700	52.5126 (77)				
Southwest				1.4500	36.7938	0.6300	0.7000	0.7700	16.3048 (79)				
Northwest				7.6000	11.2829	0.6300	0.7000	0.7700	26.2064 (81)				
Solar gains		95.0238	170.5654	256.4964	356.5662	434.7575	447.1732	424.6475	363.9345	290.7759	194.7452	115.4018	80.2948 (83)
Total gains		659.1895	748.9778	809.2043	889.0276	938.7057	929.2241	887.0509	827.3075	769.2108	693.2719	646.2121	632.1397 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	37.3151	37.4095	37.5025	37.9454	38.0295	38.4257	38.4257	38.4999	38.2721	38.0295	37.8598	37.6841
alpha	3.4877	3.4940	3.5002	3.5297	3.5353	3.5617	3.5617	3.5667	3.5515	3.5353	3.5240	3.5123
util living area	0.9766	0.9626	0.9388	0.8792	0.7720	0.6101	0.4662	0.5137	0.7292	0.9033	0.9623	0.9796 (86)
MIT	19.1771	19.4241	19.7795	20.2627	20.6546	20.8935	20.9689	20.9560	20.7919	20.2896	19.6628	19.1401 (87)
Th 2	20.0301	20.0323	20.0345	20.0446	20.0466	20.0555	20.0555	20.0571	20.0520	20.0466	20.0427	20.0387 (88)
util rest of house	0.9722	0.9556	0.9270	0.8555	0.7275	0.5383	0.3740	0.4198	0.6643	0.8792	0.9541	0.9757 (89)
MIT 2	17.9042	18.2174	18.6649	19.2650	19.7222	19.9774	20.0399	20.0335	19.8831	19.3105	18.5296	17.8629 (90)
Living area fraction	FLA = Living area / (4) =											
MIT	18.1338	18.4350	18.8659	19.4449	19.8904	20.1426	20.2074	20.1998	20.0470	19.4870	18.7340	18.0932 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.1338	18.4350	18.8659	19.4449	19.8904	20.1426	20.2074	20.1998	20.0470	19.4870	18.7340	18.0932 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9601	0.9403	0.9089	0.8380	0.7194	0.5453	0.3894	0.4346	0.6639	0.8619	0.9390	0.9646 (94)
Useful gains	632.8811	704.2519	735.5066	744.9815	675.3088	506.6952	345.3852	359.5662	510.7060	597.4999	606.7677	609.7778 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1396.0921	1362.4936	1241.7259	1046.5032	811.0369	543.1872	353.5373	371.6741	585.1594	880.0257	1157.1979	1388.3616 (97)
Space heating kWh	567.8290	442.3384	376.6272	217.0956	100.9817	0.0000	0.0000	0.0000	0.0000	210.1992	396.3097	579.2664 (98a)
Space heating requirement - total per year (kWh/year)	2890.6472											
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	567.8290	442.3384	376.6272	217.0956	100.9817	0.0000	0.0000	0.0000	0.0000	210.1992	396.3097	579.2664 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2890.6472											
Space heating per m2	(98c) / (4) = 30.4856 (99)											

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (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	567.8290	442.3384	376.6272	217.0956	100.9817	0.0000	0.0000	0.0000	0.0000	210.1992	396.3097	579.2664 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	614.5335	478.7212	407.6052	234.9520	109.2876	0.0000	0.0000	0.0000	0.0000	227.4883	428.9066	626.9117 (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	243.0850	214.9411	228.5280	201.6613	195.9126	177.0238	175.1972	181.9668	183.7274	204.2540	216.3800	240.5545 (64)
Efficiency of water heater (217)m	86.1347	85.8918	85.4443	84.5398	83.0320	80.3000	80.3000	80.3000	80.3000	84.4430	85.6601	80.3000 (216)
Fuel for water heating, kWh/month	282.2150	250.2463	267.4585	238.5400	235.9483	220.4530	218.1783	226.6087	228.8013	241.8838	252.6031	279.0933 (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	27.6486	22.1807	19.9713	14.6318	11.3020	9.2339	10.3101	13.4015	17.4072	22.8391	25.7968	28.4170 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-43.6262	-61.1261	-87.3135	-97.5169	-104.5764	-97.3718	-96.1401	-91.0328	-81.9469	-69.5695	-47.8171	-37.7597 (233a)

Full SAP Calculation Printout



Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-25.7914	-54.1297	-107.3705	-160.9638	-212.5654	-213.5113	-211.0240	-178.8145	-131.2362	-77.3387	-34.4087	-20.4067	(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												3128.4060	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2942.0297	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												223.1400	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2343.3580	(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												4036.2177	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3128.4060	0.2100	656.9653 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2942.0297	0.2100	617.8262 (264)
Space and water heating			1274.7915 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	223.1400	0.1443	32.2060 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-915.7971	0.1347	-123.3852
PV Unit electricity exported	-1427.5610	0.1259	-179.7981
Total			-303.1833 (269)
Total CO2, kg/year			1015.7434 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.7100 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3128.4060	1.1300	3535.0988 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2942.0297	1.1300	3324.4936 (278)
Space and water heating			6859.5924 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	223.1400	1.5338	342.2595 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-915.7971	1.4979	-1371.8155
PV Unit electricity exported	-1427.5610	0.4623	-659.9855
Total			-2031.8010 (283)
Total Primary energy kWh/year			5300.1517 (286)
Target Primary Energy Rate (TPER)			55.9000 (287)

Predicted Energy Assessment



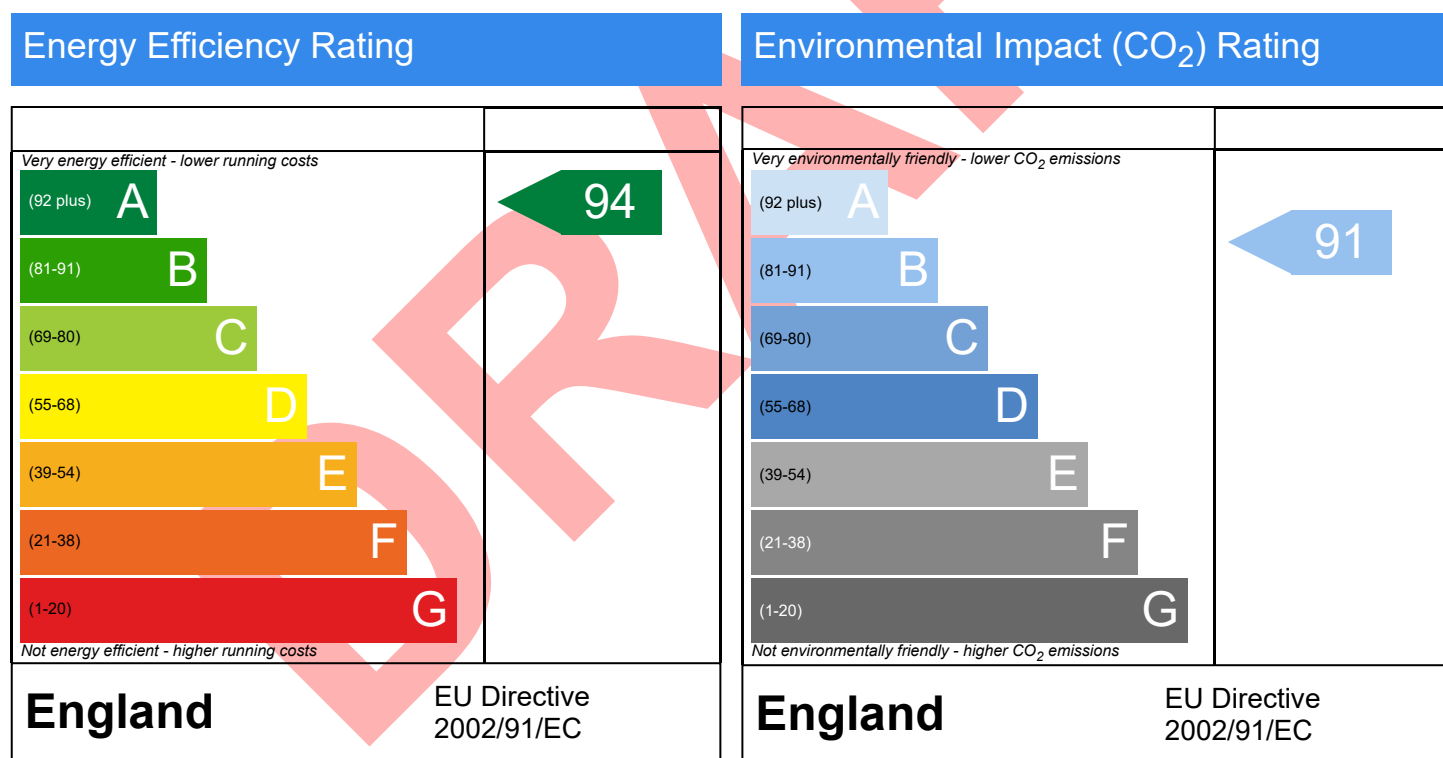
Highmoor Lane, CLECKHEATON, BD19 6LW

Dwelling type:
Date of assessment:
Produced by:
Total floor area:
DRRN:

House, Semi-Detached
07/05/2025
Paul Goddard
94.82 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

Energy Report



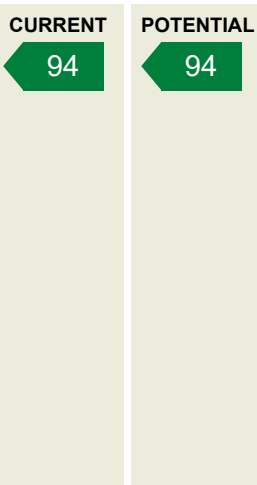
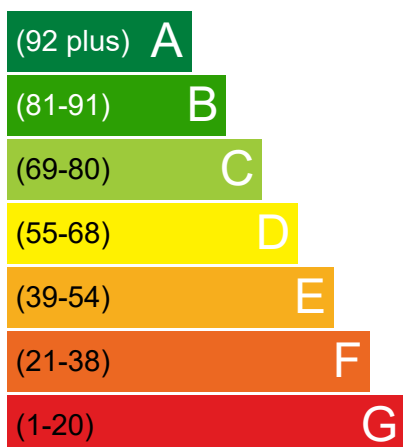
Dwelling Address	Highmoor Lane, CLECKHEATON, BD19 6LW
Reference	HT09-Semi-001
Assessment Date	07/05/2025
Submission Date	
Property Type	House, Semi-Detached
Total Floor Area	95

This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

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

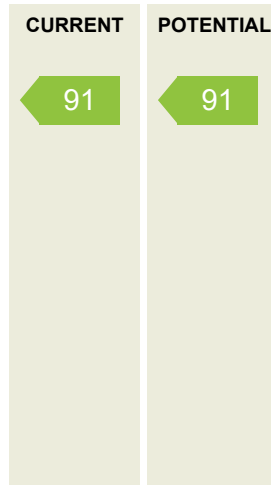
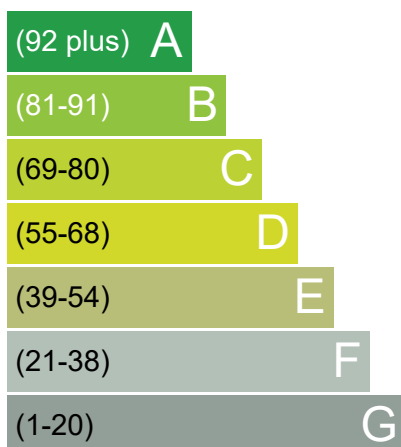
Energy Efficiency Rating

Most energy efficient - lower running costs

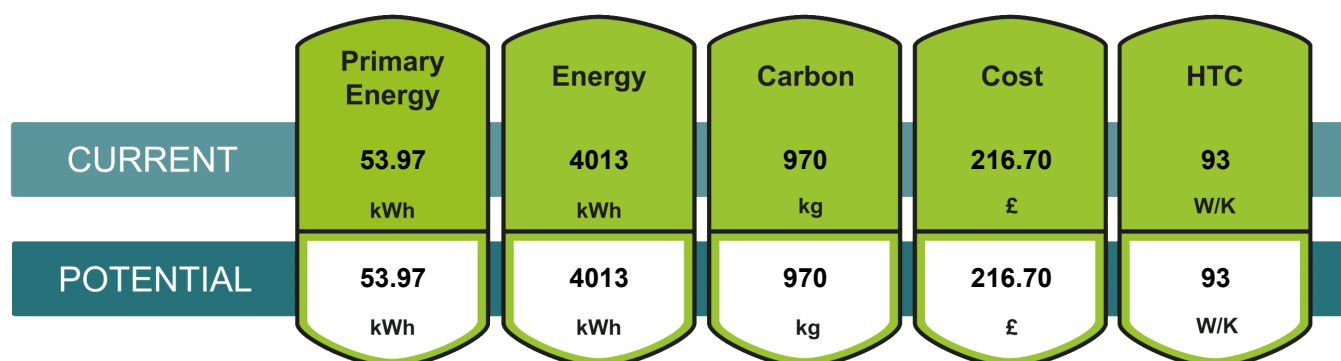


Carbon Dioxide (CO2) Emissions Rating

Very environmentally friendly - lower CO2 emissions



Additional ratings for your home



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 0.18 W/m ² K	Very Good
Roof	Average thermal transmittance 0.09 W/m ² K	Very Good
Floor	Average thermal transmittance 0.11 W/m ² K	Very Good
Windows	High performance glazing	Good
Main heating	Boiler and radiators, mains gas	Very Good
Main heating controls	Time and temperature zone control	Very Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 4.0 m ³ /h.m ² (assumed)	Good

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 measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating
Solar water heating	£19	A 95			A 92

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

		Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting		£75	£75	
Heating		£297	£297	
Hot Water		£150	£150	
New Technologies e.g. Impact of PV		-(£305)	-(£305)	
TOTAL		£217	£217	

Estimated energy use and potential savings



Space Heating

2860
kWh per year



Water Heating

2681
kWh per year

About this document

Created by:
Company/Trading name:
Phone number:
Email address:

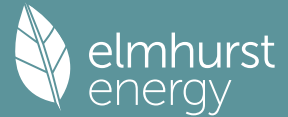
Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g. heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO ₂)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Full SAP Calculation Printout



Property Reference	HT10-Semi				Issued on Date	07/05/2025
Assessment Reference	001		Prop Type Ref			
Property	Highmoor Lane, CLECKHEATON, BD19 6LW					
SAP Rating	94 A	DER	11.01	TER	11.16	
Environmental	90 B	% DER < TER				1.34
CO ₂ Emissions (t/year)	1.03	DFEE	38.27	TFEE	38.45	
Compliance Check	See BREL	% DFEE < TFEE				0.46
% DPER < TPER	0.38	DPER	58.00	TPER	58.22	
Assessor Details	Mr. Paul Goddard				Assessor ID	B342-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	47.4800 (1b)	x 2.5000 (2b)	= 118.7000 (1b) - (3b)
First floor	47.4800 (1c)	x 2.6000 (2c)	= 123.4480 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 242.1480 (5)

2. Ventilation rate

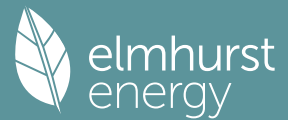
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.2000 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1700 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			2.1600	1.0000	2.1600		(26)
Window			13.6900	1.1450	15.6756		(27)
Patio Door			5.4800	1.3258	7.2652		(27)
GF			47.4800	0.1100	5.2228	9.0000	(28a)
Main	115.6680	21.3300	94.3380	0.1800	16.9808	18.0000	1698.0840 (29a)
PIJ	47.4800		47.4800	0.0900	4.2732	9.0000	427.3200 (30)
Total net area of external elements Aum(A, m ²)			210.6280				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	51.5776		(33)
Main dwelling							
Party Wall 1			28.2200	0.0000	0.0000	20.0000	564.4000 (32)
Internal Wall 1			120.4500			75.0000	9033.7498 (32c)
Internal Floor 1			47.4800			18.0000	854.6400 (32d)
Internal Ceiling 1			47.4800			9.0000	427.3200 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13432.8337 (34)

Full SAP Calculation Printout



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

141.4578 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	14.8700	0.0500	0.7435
E2 Other lintels (including other steel lintels)	14.8700	0.0500	0.7435
E3 Sill	36.4200	0.0500	1.8210
E4 Jamb	22.6800	0.1000	2.2680
E5 Ground floor (normal)	22.6800	0.0700	1.5876
E6 Intermediate floor within a dwelling	10.1900	0.0900	0.9171
E16 Corner (normal)	10.1900	0.0600	0.6114
E18 Party wall between dwellings	5.5400	0.0800	0.4432
P1 Party wall - Ground floor	5.5400	0.1200	0.6648
P4 Party wall - Roof (insulation at ceiling level)	17.1400	0.0600	1.0284
E10 Eaves (insulation at ceiling level)	5.5400	0.0600	0.3324
E12 Gable (insulation at ceiling level)			

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

11.1609 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 62.7385 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544
Heat transfer coeff	102.6929	102.6929	102.6929	102.6929	102.6929	102.6929	102.6929	102.6929	102.6929	102.6929	102.6929	102.6929
Average = Sum(39)m / 12 =												102.6929

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0814	1.0814	1.0814	1.0814	1.0814	1.0814	1.0814	1.0814	1.0814	1.0814	1.0814	1.0814
HLP (average)												1.0814
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy

2.6877 (42)

Hot water usage for mixer showers

69.2839	68.2427	66.7255	63.8225	61.6802	59.2911	57.9332	59.4389	61.0895	63.6547	66.6200	69.0185
Hot water usage for baths	29.9176	29.4733	28.8476	27.6939	26.8300	25.8722	25.3548	25.9761	26.6526	27.6776	28.8550
Hot water usage for other uses	42.1549	40.6220	39.0891	37.5562	36.0233	34.4904	34.4904	36.0233	37.5562	39.0891	40.6220
Average daily hot water use (litres/day)											

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	141.3564	138.3380	134.6621	129.0726	124.5335	119.6537	117.7783	121.4383	125.2983	130.4213	136.0969	140.9898
Energy conte	223.8740	196.9914	206.9707	176.6939	167.6461	147.1282	142.4427	150.3660	154.5053	176.9805	193.8950	220.7559
Energy content (annual)										Total = Sum(45)m =		2158.2497
Distribution loss (46)m = 0.15 x (45)m	33.5811	29.5487	31.0456	26.5041	25.1469	22.0692	21.3664	22.5549	23.1758	26.5471	29.0843	33.1134

Water storage loss:

Total storage loss

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (56)

If cylinder contains dedicated solar storage

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (57)

Primary loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (59)

Combi loss 1.5610 1.4390 1.5956 1.4708 1.4792 1.3771 1.3627 1.3779 1.3503 1.4469 1.4642 1.5482 (61)

Total heat required for water heating calculated for each month

225.4350	198.4304	208.5663	178.1647	169.1253	148.5053	143.8053	151.7439	155.8556	178.4274	195.3592	222.3041
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
FV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Output from w/h	225.4350	198.4304	208.5663	178.1647	169.1253	148.5053	143.8053	151.7439	155.8556	178.4274	195.3592

12Total per year (kWh/year)

Total per year (kWh/year) = Sum(64)m = 2175.7225 (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

74.8284 65.8594 69.2166 59.1184 56.1121 49.2644 47.7029 50.3412 51.7106 59.2077 64.8361 73.7884 (65)

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

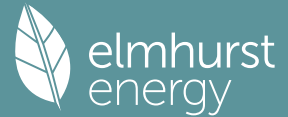
Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	125.8056	139.2847	125.8056	129.9991	125.8056	129.9991	125.8056	125.8056	129.9991	125.8056	129.9991	125.8056
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	247.9131	250.4856	244.0029	230.2018	212.7805	196.4068	185.4683	182.8957	189.3785	203.1795	220.6009	236.9745
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000
Losses e.g. evaporation (negative values) (Table 5)	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086
Water heating gains (Table 5)	100.5757	98.0051	93.0331	82.1089	75.4195	68.4228	64.1167	67.6629	71.8203	79.5803	90.0502	99.1780
Total internal gains	540.6101	554.0911	529.1573	508.6256	480.3213	458.1444	438.7063	439.6798	454.5135	474.8811	506.9659	528.2737

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	4.2800	11.2829	0.3300	0.0000	0.7700	12.2707 (75)
Southeast	3.0000	36.7938	0.3300	0.0000	0.7700	28.0479 (77)
Southwest	6.4100	36.7938	0.3300	0.0000	0.7700	59.9291 (79)
Northeast	5.4800	11.2829	0.6300	0.7000	0.7700	18.8962 (75)

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Solar gains	119.1440	213.2987	319.3424	441.7713	536.8900	551.5124	524.0159	450.2240	361.2940	243.1546	144.5923	100.7425 (83)
Total gains	659.7541	767.3898	848.4997	950.3968	1017.2112	1009.6568	962.7222	889.9038	815.8075	718.0357	651.5582	629.0162 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	36.3350	36.3350	36.3350	36.3350	36.3350	36.3350	36.3350	36.3350	36.3350	36.3350	36.3350	36.3350
alpha	3.4223	3.4223	3.4223	3.4223	3.4223	3.4223	3.4223	3.4223	3.4223	3.4223	3.4223	3.4223
util living area	0.9763	0.9599	0.9315	0.8647	0.7489	0.5895	0.4500	0.5005	0.7166	0.8982	0.9617	0.9797 (86)
MIT	19.1237	19.3938	19.7759	20.2628	20.6614	20.8912	20.9673	20.9527	20.7828	20.2587	19.5968	19.0569 (87)
Th 2	20.0160	20.0160	20.0160	20.0160	20.0160	20.0160	20.0160	20.0160	20.0160	20.0160	20.0160	20.0160 (88)
util rest of house	0.9718	0.9525	0.9186	0.8390	0.7021	0.5162	0.3570	0.4048	0.6495	0.8730	0.9533	0.9758 (89)
MIT 2	17.8289	18.1694	18.6479	19.2422	19.7016	19.9374	20.0000	19.9911	19.8415	19.2513	18.4304	17.7443 (90)
Living area fraction									fLA = Living area /			0.1874 (91)
MIT	18.0716	18.3989	18.8593	19.4335	19.8815	20.1162	20.1813	20.1713	20.0179	19.4402	18.6491	17.9904 (92)
Temperature adjustment												-0.1500
adjusted MIT	17.9216	18.2489	18.7093	19.2835	19.7315	19.9662	20.0313	20.0213	19.8679	19.2902	18.4991	17.8404 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9581	0.9345	0.8967	0.8162	0.6870	0.5123	0.3585	0.4053	0.6382	0.8497	0.9355	0.9634 (94)
Useful gains	632.1330	717.1464	760.8198	775.6954	698.8334	517.2320	345.1217	360.7191	520.6791	610.0972	609.5103	605.9704 (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	1398.8420	1370.8364	1253.8089	1066.3084	824.7812	551.0708	352.3722	371.8832	592.3226	892.4178	1170.6034	1400.7682 (97)
Space heating kWh	570.4315	439.2797	366.7839	209.2413	93.7052	0.0000	0.0000	0.0000	0.0000	210.0465	403.9870	591.3295 (98a)
Space heating requirement - total per year (kWh/year)												2884.8047
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	570.4315	439.2797	366.7839	209.2413	93.7052	0.0000	0.0000	0.0000	0.0000	210.0465	403.9870	591.3295 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2884.8047
Space heating per m2										(98c) / (4) =		30.3792 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												88.7000 (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	570.4315	439.2797	366.7839	209.2413	93.7052	0.0000	0.0000	0.0000	0.0000	210.0465	403.9870	591.3295 (98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)
Space heating fuel (main heating system)	643.1020	495.2420	413.5106	235.8978	105.6428	0.0000	0.0000	0.0000	0.0000	236.8056	455.4532	666.6624 (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	225.4350	198.4304	208.5663	178.1647	169.1253	148.5053	143.8053	151.7439	155.8556	178.4274	195.3592	222.3041 (64)
Efficiency of water heater (217)m	84.7615	84.3923	83.7214	82.4778	80.2310	76.2000	76.2000	76.2000	76.2000	82.4852	84.1979	76.2000 (216)
Fuel for water heating, kWh/month	265.9640	235.1285	249.1193	216.0155	210.7978	194.8888	188.7209	199.1390	204.5349	216.3146	232.0238	261.8578 (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	11.3307	10.2342	11.3307	10.9652	11.3307	10.9652	11.3307	11.3307	10.9652	11.3307	10.9652	11.3307 (231)
Lighting	29.5888	23.7372	21.3727	15.6586	12.0951	9.8818	11.0336	14.3419	18.6287	24.4418	27.6070	30.4111 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-37.6572	-53.6893	-78.0210	-88.7084	-96.4844	-90.3590	-89.2731	-83.9078	-74.5173	-61.8874	-41.6249	-32.4892 (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	-19.4465	-41.1215	-82.1282	-123.9208	-164.4001	-165.3769	-163.4035	-138.0717	-100.8495	-58.9609	-26.0150	-15.3592 (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												3252.3164 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												76.2000
Water heating fuel used												2674.5048 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:
(MEVDcentralised, Database: total watage = 4.6540, total flow = 29.0000, SFP = 0.1605)

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mechanical ventilation fans (SFP = 0.1605)	47.4099 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	133.4099 (231)
Electricity for lighting (calculated in Appendix L)	238.7984 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1927.6727 (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	4371.3568 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3252.3164	0.2100	682.9864 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2674.5048	0.2100	561.6460 (264)
Space and water heating			1244.6325 (265)
Pumps, fans and electric keep-hot	133.4099	0.1432	18.8939 (267)
Energy for lighting	238.7984	0.1490	35.5857 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-828.6190	0.1387	-114.9243
PV Unit electricity exported	-1099.0538	0.1258	-138.2206
Total			-253.1449 (269)
Total CO2, kg/year			1045.9671 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.0100 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3252.3164	1.1300	3675.1176 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2674.5048	1.1300	3022.1905 (278)
Space and water heating			6697.3080 (279)
Pumps, fans and electric keep-hot	133.4099	1.5335	203.6088 (281)
Energy for lighting	238.7984	1.5547	371.2705 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-828.6190	1.5170	-1257.0366
PV Unit electricity exported	-1099.0538	0.4616	-507.3580
Total			-1764.3946 (283)
Total Primary energy kWh/year			5507.7927 (286)
Dwelling Primary energy Rate (DPER)			58.0000 (287)

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

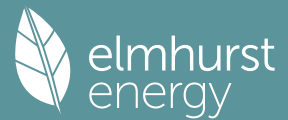
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	47.4800 (1b)	x 2.5000 (2b)	= 118.7000 (1b) - (3b)
First floor	47.4800 (1c)	x 2.6000 (2c)	= 123.4480 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	242.1480 (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) = 0.1239 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3739 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3178 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4052	0.3973	0.3893	0.3496	0.3416	0.3019	0.3019	0.2940	0.3178	0.3416	0.3575	0.3734 (22b)
	0.5821	0.5789	0.5758	0.5611	0.5584	0.5456	0.5456	0.5432	0.5505	0.5584	0.5639	0.5697 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.1600	1.0000	2.1600		(26)
TER Opening Type			19.1700	1.1450	21.9504		(27)
GF			47.4800	0.1300	6.1724		(28a)
Main	115.6680	21.3300	94.3380	0.1800	16.9808		(29a)
PIJ	47.4800		47.4800	0.1100	5.2228		(30)
Total net area of external elements Aum(A, m2)			210.6280				(31)
Fabric heat loss, W/K = Sum (A x U)					52.4864		(33)
Main dwelling							
Party Wall 1			28.2200	0.0000	0.0000		(32)

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

141.4578 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	14.8700	0.0500	0.7435
E3 Sill	14.8700	0.0500	0.7435
E4 Jamb	36.4200	0.0500	1.8210
E5 Ground floor (normal)	22.6800	0.1600	3.6288
E6 Intermediate floor within a dwelling	22.6800	0.0000	0.0000
E16 Corner (normal)	10.1900	0.0900	0.9171
E18 Party wall between dwellings	10.1900	0.0600	0.6114
P1 Party wall - Ground floor	5.5400	0.0800	0.4432
P4 Party wall - Roof (insulation at ceiling level)	5.5400	0.1200	0.6648
E10 Eaves (insulation at ceiling level)	17.1400	0.0600	1.0284
E12 Gable (insulation at ceiling level)	5.5400	0.0600	0.3324
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			10.9341 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 63.4205 (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
46.5146	46.2598	46.0101	44.8373	44.6179	43.5964	43.5964	43.4073	43.9899	44.6179	45.0618	45.5259 (38)
Heat transfer coeff											
109.9351	109.6803	109.4307	108.2578	108.0384	107.0169	107.0169	106.8278	107.4104	108.0384	108.4823	108.9464 (39)
Average = Sum(39)m / 12 =											108.2568

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.1577	1.1550	1.1524	1.1400	1.1377	1.1270	1.1270	1.1250	1.1311	1.1377	1.1424	1.1473 (40)
HLP (average)											1.1400
Days in mont	31	28	31	30	31	30	31	30	31	30	31

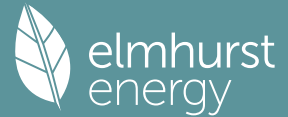
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6877 (42)
Hot water usage for mixer showers	69.2839	68.2427	66.7255	63.8225	61.6802	59.2911	57.9332	59.4389	61.0895	63.6547	66.6200	69.0185 (42a)
Hot water usage for baths	29.9176	29.4733	28.8476	27.6939	26.8300	25.8722	25.3548	25.9761	26.6526	27.6776	28.8550	29.8164 (42b)
Hot water usage for other uses	42.1549	40.6220	39.0891	37.5562	36.0233	34.4904	34.4904	36.0233	37.5562	39.0891	40.6220	42.1549 (42c)
Average daily hot water use (litres/day)												129.9384 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	141.3564	138.3380	134.6621	129.0726	124.5335	119.6537	117.7783	121.4383	125.2983	130.4213	136.0969	140.9898 (44)
Distribution loss (46)m = 0.15 x (45)m	223.8740	196.9914	206.9707	176.6939	167.6461	147.1282	142.4427	150.3660	154.5053	176.9805	193.8950	220.7559 (45)
	33.5811	29.5487	31.0456	26.5041	25.1469	22.0692	21.3664	22.5549	23.1758	26.5471	29.0843	33.1134 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	274.8329	243.0188	257.9296	226.0090	218.6050	196.4432	193.4016	201.3249	203.8204	227.9394	243.2101	271.7149 (62)
WWHRS	-31.6737	-28.0125	-29.3331	-24.2889	-22.6364	-19.3701	-18.1564	-19.3075	-20.0411	-23.6262	-26.7657	-31.0872 (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	243.1592	215.0063	228.5965	201.7201	195.9686	177.0731	175.2452	182.0173	183.7793	204.3131	216.4444	240.6277 (64)
12Total per year (kWh/year)												2463.9507 (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	2464 (64)
												0.0000 (64a)
												0.0000 (64a)
Heat gains from water heating, kWh/month	87.1778	77.0065	81.5575	71.0795	68.4820	61.2489	60.1019	62.7364	63.7018	71.5857	76.7989	86.1411 (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	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	125.8056	139.2847	125.8056	129.9991	125.8056	129.9991	125.8056	125.8056	129.9991	125.8056	129.9991	125.8056 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	247.9131	250.4856	244.0029	230.2018	212.7805	196.4068	185.4683	182.8957	189.3785	203.1795	220.6009	236.9745 (68)

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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5											
Pumps, fans	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386 (69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086 (71)
Total internal gains	117.1745	114.5930	109.6203	98.7215	92.0458	85.0679	80.7821	84.3231	88.4747	96.2174	106.6651 (72)
	557.2089	570.6791	545.7444	525.2381	496.9475	474.7895	455.3717	456.3401	471.1680	491.5182	523.5808 (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					9.7600	11.2829	0.6300	0.7000			0.7700	33.6546 (75)
Southeast					3.0000	36.7938	0.6300	0.7000			0.7700	33.7340 (77)
Southwest					6.4100	36.7938	0.6300	0.7000			0.7700	72.0784 (79)
Solar gains	139.4669	248.7425	370.0329	508.2580	614.7185	630.2550	599.3176	516.8384	417.4194	282.9193	169.0850	118.0374 (83)
Total gains	696.6758	819.4216	915.7773	1033.4962	1111.6660	1105.0446	1054.6893	973.1785	888.5873	774.4375	692.6658	662.9142 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	33.9413	34.0202	34.0978	34.4672	34.5372	34.8668	34.8668	34.9286	34.7391	34.5372	34.3959	34.2493
alpha	3.2628	3.2680	3.2732	3.2978	3.3025	3.3245	3.3245	3.3286	3.3159	3.3025	3.2931	3.2833
util living area	0.9733	0.9547	0.9227	0.8488	0.7274	0.5648	0.4290	0.4778	0.6944	0.8861	0.9567	0.9770 (86)
MIT	19.0141	19.3118	19.7258	20.2543	20.6617	20.8949	20.9681	20.9543	20.7856	20.2457	19.5442	18.9657 (87)
Th 2	19.9540	19.9562	19.9583	19.9683	19.9701	19.9789	19.9789	19.9805	19.9755	19.9701	19.9664	19.9624 (88)
util rest of house	0.9682	0.9463	0.9081	0.8205	0.6779	0.4906	0.3364	0.3822	0.6245	0.8582	0.9473	0.9726 (89)
MIT 2	17.6510	18.0269	18.5451	19.1938	19.6606	19.9044	19.9637	19.9570	19.8066	19.2006	18.3316	17.5951 (90)
Living area fraction	FLA = Living area / (4) =											
MIT	17.9065	18.2677	18.7664	19.3926	19.8483	20.0901	20.1520	20.1440	19.9901	19.3965	18.5589	17.8520 (92)
Temperature adjustment	0.0000											
adjusted MIT	17.9065	18.2677	18.7664	19.3926	19.8483	20.0901	20.1520	20.1440	19.9901	19.3965	18.5589	17.8520 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9541	0.9281	0.8871	0.8022	0.6715	0.4991	0.3526	0.3982	0.6256	0.8392	0.9298	0.9597 (94)
Useful gains	664.6814	760.5156	812.3553	829.0468	746.5119	551.4937	371.8482	387.4847	555.8575	649.9059	644.0092	636.1983 (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	1495.8335	1466.1778	1342.3241	1135.9015	880.3266	587.5305	380.1222	399.9609	632.6550	950.3611	1243.0879	1487.3385 (97)
Space heating kWh	618.3772	474.2050	394.2968	220.9354	99.5581	0.0000	0.0000	0.0000	0.0000	223.5386	431.3367	633.2484 (98a)
Space heating requirement - total per year (kWh/year)	3095.4962											
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	618.3772	474.2050	394.2968	220.9354	99.5581	0.0000	0.0000	0.0000	0.0000	223.5386	431.3367	633.2484 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	3095.4962											
Space heating per m2	(98c) / (4) = 32.5979 (99)											

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)											
Fraction of space heat from main system(s)	1.0000 (202)											
Efficiency of main space heating system 1 (in %)	92.4000 (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	618.3772	474.2050	394.2968	220.9354	99.5581	0.0000	0.0000	0.0000	0.0000	223.5386	431.3367	633.2484 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	669.2394	513.2088	426.7281	239.1076	107.7469	0.0000	0.0000	0.0000	0.0000	241.9249	466.8146	685.3337 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	243.1592	215.0063	228.5965	201.7201	195.9686	177.0731	175.2452	182.0173	183.7793	204.3131	216.4444	240.6277 (64)
Efficiency of water heater (217)m	86.2916	86.0258	85.5380	84.5769	83.0051	80.3000	80.3000	80.3000	80.3000	84.5746	85.8286	80.3000 (216)
Fuel for water heating, kWh/month	281.7876	249.9323	267.2456	238.5050	236.0922	220.5144	218.2381	226.6717	228.8659	241.5774	252.1821	278.6545 (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	26.1399	20.9704	18.8815	13.8334	10.6853	8.7300	9.7475	12.6702	16.4573	21.5929	24.3891	26.8664 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-43.6361	-61.1225	-87.2962	-97.4949	-104.5599	-97.3606	-96.1130	-90.9815	-81.8863	-69.5333	-47.8138	-37.7690 (233a)

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Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-25.8839	-54.3035	-107.6752	-161.3674	-213.0502	-213.9815	-211.5046	-179.2642	-131.6115	-77.5919	-34.5334	-20.4833	(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												3350.1041	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2940.2667	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												210.9640	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2346.8179	(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												4240.5169	(238)

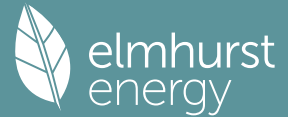
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3350.1041	0.2100	703.5219	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2940.2667	0.2100	617.4560	(264)
Space and water heating			1320.9779	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	210.9640	0.1443	30.4486	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-915.5672	0.1347	-123.3569	
PV Unit electricity exported	-1431.2508	0.1260	-180.2751	
Total			-303.6320	(269)
Total CO2, kg/year			1059.7237	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.1600	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3350.1041	1.1300	3785.6176	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2940.2667	1.1300	3322.5014	(278)
Space and water heating			7108.1190	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	210.9640	1.5338	323.5837	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-915.5672	1.4980	-1371.4810	
PV Unit electricity exported	-1431.2508	0.4623	-661.7371	
Total			-2033.2181	(283)
Total Primary energy kWh/year			5528.5853	(286)
Target Primary Energy Rate (TPER)			58.2200	(287)

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Property Reference	HT10-Semi				Issued on Date	07/05/2025
Assessment Reference	001		Prop Type Ref			
Property	Highmoor Lane, CLECKHEATON, BD19 6LW					
SAP Rating	94 A	DER	11.01	TER	11.16	
Environmental	90 B	% DER < TER				1.34
CO ₂ Emissions (t/year)	1.03	DFEE	38.27	TFEE	38.45	
Compliance Check	See BREL	% DFEE < TFEE				0.46
% DPER < TPER	0.38	DPER	58.00	TPER	58.22	
Assessor Details	Mr. Paul Goddard				Assessor ID	B342-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	47.4800 (1b)	x 2.5000 (2b)	= 118.7000 (1b) - (3b)
First floor	47.4800 (1c)	x 2.6000 (2c)	= 123.4480 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 242.1480 (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) = 0.1239 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3239 (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) = 0.2753 (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	0.3510	0.3441	0.3373	0.3028	0.2960	0.2615	0.2615	0.2547	0.2753	0.2960	0.3097	0.3235 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5616	0.5592	0.5569	0.5459	0.5438	0.5342	0.5342	0.5324	0.5379	0.5438	0.5480	0.5523 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			2.1600	1.0000	2.1600		(26)
Window			13.6900	1.1450	15.6756		(27)
Patio Door			5.4800	1.3258	7.2652		(27)
GF			47.4800	0.1100	5.2228	9.0000	427.3200 (28a)
Main	115.6680	21.3300	94.3380	0.1800	16.9808	18.0000	1698.0840 (29a)
PIJ	47.4800		47.4800	0.0900	4.2732	9.0000	427.3200 (30)
Total net area of external elements Aum(A, m ²)			210.6280				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	51.5776		(33)
Main dwelling							
Party Wall 1			28.2200	0.0000	0.0000	20.0000	564.4000 (32)
Internal Wall 1			120.4500			75.0000	9033.7498 (32c)
Internal Floor 1			47.4800			18.0000	854.6400 (32d)
Internal Ceiling 1			47.4800			9.0000	427.3200 (32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		13432.8337 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							141.4578 (35)
List of Thermal Bridges							

elmhurst
energy

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	44.8773	44.6862	44.4988	43.6187	43.4540	42.6875	42.6875	42.5455	42.9827	43.4540	43.7871	44.1354 (38)
Heat transfer coeff	107.6158	107.4246	107.2372	106.3571	106.1925	105.4259	105.4259	105.2840	105.7212	106.1925	106.5256	106.8738 (39)
Average = Sum(39)m / 12 =												106.3564
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1333	1.1313	1.1293	1.1200	1.1183	1.1102	1.1102	1.1087	1.1133	1.1183	1.1218	1.1255 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

Assumed occupancy												2.6877 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	29.9176	29.4733	28.8476	27.6939	26.8300	25.8722	25.3548	25.9761	26.6526	27.6776	28.8550	29.8164 (42b)
Hot water usage for other uses	42.1549	40.6220	39.0891	37.5562	36.0233	34.4904	34.4904	36.0233	37.5562	39.0891	40.6220	42.1549 (42c)
Average daily hot water use (litres/day)												66.0609 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	72.0725	70.0952	67.9366	65.2501	62.8533	60.3625	59.8451	61.9994	64.2088	66.7666	69.4770	71.9713 (44)
Energy content (annual)	114.1452	99.8147	104.4161	89.3241	84.6127	74.2228	72.3775	76.7682	79.1758	90.6017	98.9827	112.6897 (45)
Distribution loss (46)m = 0.15 x (45)m												1097.1311
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	97.0234	84.8425	88.7537	75.9255	71.9208	63.0894	61.5209	65.2529	67.2995	77.0114	84.1353	95.7863 (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	97.0234	84.8425	88.7537	75.9255	71.9208	63.0894	61.5209	65.2529	67.2995	77.0114	84.1353	95.7863 (64)
12Total per year (kWh/year)												932.5614 (64a)
Electric shower(s)	55.4849	49.4375	53.9838	51.5161	52.4828	50.0635	51.7323	52.4828	51.5161	53.9838	52.9687	55.4849 (64a)
												631.1372 (64a)
Heat gains from water heating, kWh/month	38.1271	33.5700	35.6844	31.8604	31.1009	28.2882	28.3133	29.4339	29.7039	32.7488	34.2760	37.8178 (65)

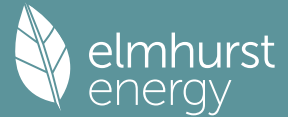
Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	125.8056	139.2847	125.8056	129.9991	125.8056	129.9991	125.8056	125.8056	129.9991	125.8056	129.9991	125.8056 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	247.9131	250.4856	244.0029	230.2018	212.7805	196.4068	185.4683	182.8957	189.3785	203.1795	220.6009	236.9745 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386 (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)	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086 (71)
Water heating gains (Table 5)	51.2461	49.9553	47.9629	44.2506	41.8023	39.2892	38.0555	39.5617	41.2554	44.0172	47.6056	50.8304 (72)
Total internal gains	488.2804	503.0414	481.0870	467.7672	443.7040	429.0108	412.6450	411.5787	423.9487	436.3180	461.5212	476.9261 (73)

[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				4.2800	11.2829		0.3300		0.0000		0.7700	12.2707 (75)		
Southeast				3.0000	36.7938		0.3300		0.0000		0.7700	28.0479 (77)		
Southwest				6.4100	36.7938		0.3300		0.0000		0.7700	59.9291 (79)		
Northeast				5.4800	11.2829		0.6300		0.7000		0.7700	18.8962 (75)		

Solar gains	119.1440	213.2987	319.3424	441.7713	536.8900	551.5124	524.0159	450.2240	361.2940	243.1546	144.5923	100.7425 (83)		

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Total gains 607.4244 716.3401 800.4294 909.5384 980.5940 980.5232 936.6609 861.8027 785.2427 679.4726 606.1135 577.6686 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	34.6728	34.7345	34.7952	35.0831	35.1375	35.3930	35.3930	35.4407	35.2942	35.1375	35.0277	34.9135
alpha	3.3115	3.3156	3.3197	3.3389	3.3425	3.3595	3.3595	3.3627	3.3529	3.3425	3.3352	3.3276
util living area	0.9816	0.9678	0.9432	0.8817	0.7724	0.6121	0.4705	0.5234	0.7411	0.9137	0.9693	0.9843 (86)
MIT	18.9262	19.2095	19.6171	20.1595	20.6009	20.8704	20.9597	20.9422	20.7438	20.1614	19.4527	18.8768 (87)
Th 2	19.9738	19.9754	19.9770	19.9845	19.9859	19.9925	19.9925	19.9937	19.9900	19.9859	19.9831	19.9801 (88)
util rest of house	0.9780	0.9616	0.9319	0.8577	0.7264	0.5368	0.3724	0.4231	0.6743	0.8909	0.9623	0.9812 (89)
MIT 2	18.0869	18.3674	18.7681	19.2934	19.6953	19.9192	19.9771	19.9699	19.8282	19.3073	18.6161	18.0424 (90)
Living area fraction	18.2442	18.5252	18.9273	19.4557	19.8651	20.0975	20.1613	20.1522	19.9998	19.4674	18.7729	18.1988 (91)
MIT	18.2442	18.5252	18.9273	19.4557	19.8651	20.0975	20.1613	20.1522	19.9998	19.4674	18.7729	18.1988 (92)
Temperature adjustment												0.0000
adjusted MIT	18.2442	18.5252	18.9273	19.4557	19.8651	20.0975	20.1613	20.1522	19.9998	19.4674	18.7729	18.1988 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9696	0.9499	0.9173	0.8430	0.7203	0.5451	0.3895	0.4397	0.6751	0.8765	0.9512	0.9737 (94)
Useful gains	588.9588	680.4801	734.2653	766.7782	706.3265	534.5092	364.8280	378.9775	530.0885	595.5716	576.5218	562.4750 (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	1500.6170	1463.6869	1332.6658	1122.6759	867.0680	579.5764	375.4554	395.0415	623.7351	941.6480	1243.4629	1496.1082 (97)
Space heating kWh	678.2737	526.3149	445.2100	256.2463	119.5917	0.0000	0.0000	0.0000	0.0000	257.4808	480.1976	694.6231 (98a)
Space heating requirement - total per year (kWh/year)												3457.9382
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	678.2737	526.3149	445.2100	256.2463	119.5917	0.0000	0.0000	0.0000	0.0000	257.4808	480.1976	694.6231 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3457.9382
Space heating per m2										(98c) / (4) =		36.4147 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W												
	0.0000	0.0000	0.0000	0.0000	0.0000	991.0038	780.1519	800.1583	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8077	0.8687	0.8360	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	800.3978	677.7115	668.9161	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1095.6344	1046.8222	961.8048	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	212.5704	274.6183	217.9092	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												
Intermittency factor (Table 10b)									fc = cooled area / (4) =			1.0000 (105)
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	53.1426	68.6546	54.4773	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												176.2745 (107)
Energy for space heating												36.4147 (99)
Energy for space cooling												1.8563 (108)
Total												38.2710 (109)
Fabric Energy Efficiency (DFEE)												38.3 (109)

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

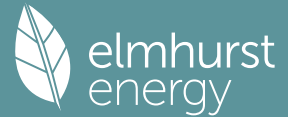
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	47.4800 (1b)	x 2.5000 (2b)	= 118.7000 (1b) - (3b)
First floor	47.4800 (1c)	x 2.6000 (2c)	= 123.4480 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	242.1480 (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)

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Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1239 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3739	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3178 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000	(22)
Wind factor	Jan 1.2750 Feb 1.2500 Mar 1.2250 Apr 1.1000 May 1.0750 Jun 0.9500 Jul 0.9500 Aug 0.9250 Sep 1.0000 Oct 1.0750 Nov 1.1250 Dec 1.1750	(22a)
Adj infilt rate	0.4052 0.3973 0.3893 0.3496 0.3416 0.3019 0.3019 0.2940 0.3178 0.3416 0.3575 0.3734	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		0.0000 (23c)
Effective ac	0.5821 0.5789 0.5758 0.5611 0.5584 0.5456 0.5456 0.5432 0.5505 0.5584 0.5639 0.5697	(25)

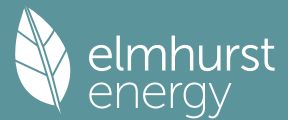
3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.1600	1.0000	2.1600		(26)
TER Opening Type			19.1700	1.1450	21.9504		(27)
GF			47.4800	0.1300	6.1724		(28a)
Main	115.6680	21.3300	94.3380	0.1800	16.9808		(29a)
PIJ	47.4800		47.4800	0.1100	5.2228		(30)
Total net area of external elements Aum(A, m2)			210.6280				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	52.4864	(33)
Main dwelling							
Party Wall 1			28.2200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							141.4578 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				14.8700	0.0500	0.7435	
E3 Sill				14.8700	0.0500	0.7435	
E4 Jamb				36.4200	0.0500	1.8210	
E5 Ground floor (normal)				22.6800	0.1600	3.6288	
E6 Intermediate floor within a dwelling				22.6800	0.0000	0.0000	
E16 Corner (normal)				10.1900	0.0900	0.9171	
E18 Party wall between dwellings				10.1900	0.0600	0.6114	
P1 Party wall - Ground floor				5.5400	0.0800	0.4432	
P4 Party wall - Roof (insulation at ceiling level)				5.5400	0.1200	0.6648	
E10 Eaves (insulation at ceiling level)				17.1400	0.0600	1.0284	
E12 Gable (insulation at ceiling level)				5.5400	0.0600	0.3324	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.9341 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	63.4205 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	Jan 46.5146 Feb 46.2598 Mar 46.0101 Apr 44.8373 May 44.6179 Jun 43.5964 Jul 43.5964 Aug 43.4073 Sep 43.9899 Oct 44.6179 Nov 45.0618 Dec 45.5259						(38)
Heat transfer coeff	109.9351 109.6803 109.4307 108.2578 108.0384 107.0169 107.0169 106.8278 107.4104 108.0384 108.4823 108.9464						(39)
Average = Sum(39)m / 12 =							108.2568
HLP	Jan 1.1577 Feb 1.1550 Mar 1.1524 Apr 1.1400 May 1.1377 Jun 1.1270 Jul 1.1270 Aug 1.1250 Sep 1.1311 Oct 1.1377 Nov 1.1424 Dec 1.1473						(40)
HLP (average)							1.1400
Days in mont	31 28 31 30 31 30 31 31 30 31 30 31						

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6877 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths												29.9176 29.4733 28.8476 27.6939 26.8300 25.8722 25.3548 25.9761 26.6526 27.6776 28.8550 29.8164 (42b)
Hot water usage for other uses												42.1549 40.6220 39.0891 37.5562 36.0233 34.4904 34.4904 36.0233 37.5562 39.0891 40.6220 42.1549 (42c)
Average daily hot water use (litres/day)												66.0609 (43)
Daily hot water use	Jan 72.0725 Feb 70.0952 Mar 67.9366 Apr 65.2501 May 62.8533 Jun 60.3625 Jul 59.8451 Aug 61.9994 Sep 64.2088 Oct 66.7666 Nov 69.4770 Dec 71.9713 (44)											
Energy conte	114.1452 99.8147 104.4161 89.3241 84.6127 74.2228 72.3775 76.7682 79.1758 90.6017 98.9827 112.6897 (45)											
Energy content (annual)												Total = Sum(45)m = 1097.1311
Distribution loss (46)m = 0.15 x (45)m												0.0000 (46)
Water storage loss:												
Total storage loss	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (56)											
If cylinder contains dedicated solar storage												0.0000 (57)
Primary loss	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (59)											
Combi loss	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)											
Total heat required for water heating calculated for each month	97.0234 84.8425 88.7537 75.9255 71.9208 63.0894 61.5209 65.2529 67.2995 77.0114 84.1353 95.7863 (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	97.0234 84.8425 88.7537 75.9255 71.9208 63.0894 61.5209 65.2529 67.2995 77.0114 84.1353 95.7863 (64)											
12Total per year (kWh/year)												Total per year (kWh/year) = Sum(64)m = 932.5614 (64)
												933 (64)

Full SAP Calculation Printout



Electric shower(s)	55.4849	49.4375	53.9838	51.5161	52.4828	50.0635	51.7323	52.4828	51.5161	53.9838	52.9687	55.4849 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												631.1372 (64a)
Heat gains from water heating, kWh/month	38.1271	33.5700	35.6844	31.8604	31.1009	28.2882	28.3133	29.4339	29.7039	32.7488	34.2760	37.8178 (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	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	125.8056	139.2847	125.8056	129.9991	125.8056	129.9991	125.8056	125.8056	129.9991	125.8056	129.9991	125.8056	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	247.9131	250.4856	244.0029	230.2018	212.7805	196.4068	185.4683	182.8957	189.3785	203.1795	220.6009	236.9745	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	(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)	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	(71)
Water heating gains (Table 5)	51.2461	49.9553	47.9629	44.2506	41.8023	39.2892	38.0555	39.5617	41.2554	44.0172	47.6056	50.8304	(72)
Total internal gains	488.2804	503.0414	481.0870	467.7672	443.7040	429.0108	412.6450	411.5787	423.9487	436.3180	461.5212	476.9261	(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					9.7600	11.2829		0.6300	0.7000	0.7700		33.6546 (75)	
Southeast					3.0000	36.7938		0.6300	0.7000	0.7700		33.7340 (77)	
Southwest					6.4100	36.7938		0.6300	0.7000	0.7700		72.0784 (79)	
Solar gains	139.4669	248.7425	370.0329	508.2580	614.7185	630.2550	599.3176	516.8384	417.4194	282.9193	169.0850	118.0374 (83)	
Total gains	627.7474	751.7839	851.1199	976.0252	1058.4225	1059.2659	1011.9626	928.4171	841.3680	719.2374	630.6062	594.9635 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	33.9413	34.0202	34.0978	34.4672	34.5372	34.8668	34.8668	34.9286	34.7391	34.5372	34.3959	34.2493	
alpha	3.2628	3.2680	3.2732	3.2978	3.3025	3.3245	3.3245	3.3286	3.3159	3.3025	3.2931	3.2833	
util living area	0.9800	0.9638	0.9351	0.8654	0.7472	0.5834	0.4450	0.4973	0.7174	0.9033	0.9662	0.9830	(86)
MIT	18.9062	19.2127	19.6416	20.1981	20.6311	20.8842	20.9645	20.9486	20.7624	20.1827	19.4522	18.8577	(87)
Th 2	19.9540	19.9562	19.9583	19.9683	19.9701	19.9789	19.9789	19.9805	19.9755	19.9701	19.9664	19.9624	(88)
util rest of house	0.9760	0.9569	0.9224	0.8391	0.6989	0.5082	0.3497	0.3990	0.6485	0.8784	0.9586	0.9797	(89)
MIT 2	18.0532	18.3565	18.7771	19.3146	19.7050	19.9144	19.9656	19.9597	19.8278	19.3138	18.6034	18.0111	(90)
Living area fraction	18.2131	18.5170	18.9391	19.4802	19.8786	20.0962	20.1528	20.1451	20.0030	19.4767	18.7625	18.1698	(91)
MIT	18.2131	18.5170	18.9391	19.4802	19.8786	20.0962	20.1528	20.1451	20.0030	19.4767	18.7625	18.1698	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2131	18.5170	18.9391	19.4802	19.8786	20.0962	20.1528	20.1451	20.0030	19.4767	18.7625	18.1698	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	607.0346	709.9313	771.8892	804.7996	734.7317	548.0270	370.9137	385.8891	547.3202	621.3044	596.9771	578.0703	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1529.5391	1493.5126	1361.2240	1145.3859	883.5991	588.1840	380.2119	400.0762	634.0414	959.0261	1265.1778	1521.9605	(97)
Space heating kWh	686.3434	526.5667	438.4651	245.2222	110.7574	0.0000	0.0000	0.0000	0.0000	251.2650	481.1044	702.2543	(98a)
Space heating requirement - total per year (kWh/year)												3441.9784	
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	686.3434	526.5667	438.4651	245.2222	110.7574	0.0000	0.0000	0.0000	0.0000	251.2650	481.1044	702.2543	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3441.9784	
Space heating per m ²												36.2466	(99)

8c. Space cooling requirement

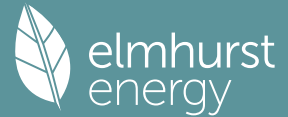
Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1005.9593	791.9254	811.8911	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8280	0.8842	0.8536	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	832.9842	700.2149	693.0457	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1187.6713	1134.8371	1039.6658	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	255.3747	323.3589	257.8854	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fc = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	63.8437	80.8397	64.4713	0.0000	0.0000	0.0000	0.0000	(107)

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Space cooling requirement	209.1547	(107)
Energy for space heating	36.2466	(99)
Energy for space cooling	2.2026	(108)
Total	38.4492	(109)
Fabric Energy Efficiency (TFEE)	38.4	(109)

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Property Reference	HT10-Semi				Issued on Date	07/05/2025
Assessment Reference	001		Prop Type Ref			
Property	Highmoor Lane, CLECKHEATON, BD19 6LW					
SAP Rating	94 A	DER	11.01	TER	11.16	
Environmental	90 B	% DER < TER				1.34
CO ₂ Emissions (t/year)	1.03	DFEE	38.27	TFEE	38.45	
Compliance Check	See BREL	% DFEE < TFEE				0.46
% DPER < TPER	0.38	DPER	58.00	TPER	58.22	
Assessor Details	Mr. Paul Goddard				Assessor ID	B342-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	47.4800 (1b)	x 2.5000 (2b)	= 118.7000 (1b) - (3b)
First floor	47.4800 (1c)	x 2.6000 (2c)	= 123.4480 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 242.1480 (5)

2. Ventilation rate

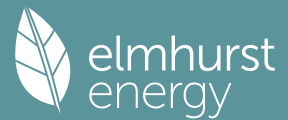
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.2000 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1700 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			2.1600	1.0000	2.1600		(26)
Window			13.6900	1.1450	15.6756		(27)
Patio Door			5.4800	1.3258	7.2652		(27)
GF			47.4800	0.1100	5.2228	9.0000	(28a)
Main	115.6680	21.3300	94.3380	0.1800	16.9808	18.0000	1698.0840 (29a)
PIJ	47.4800		47.4800	0.0900	4.2732	9.0000	427.3200 (30)
Total net area of external elements Aum(A, m ²)			210.6280				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	51.5776		(33)
Main dwelling							
Party Wall 1			28.2200	0.0000	0.0000	20.0000	564.4000 (32)
Internal Wall 1			120.4500			75.0000	9033.7498 (32c)
Internal Floor 1			47.4800			18.0000	854.6400 (32d)
Internal Ceiling 1			47.4800			9.0000	427.3200 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13432.8337 (34)

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

141.4578 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	14.8700	0.0500	0.7435
E2 Other lintels (including other steel lintels)	14.8700	0.0500	0.7435
E3 Sill	36.4200	0.0500	1.8210
E4 Jamb	22.6800	0.1000	2.2680
E5 Ground floor (normal)	22.6800	0.0700	1.5876
E6 Intermediate floor within a dwelling	10.1900	0.0900	0.9171
E16 Corner (normal)	10.1900	0.0600	0.6114
E18 Party wall between dwellings	5.5400	0.0800	0.4432
P1 Party wall - Ground floor	5.5400	0.1200	0.6648
P4 Party wall - Roof (insulation at ceiling level)	17.1400	0.0600	1.0284
E10 Eaves (insulation at ceiling level)	5.5400	0.0600	0.3324
E12 Gable (insulation at ceiling level)			

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

11.1609 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 62.7385 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544
Heat transfer coeff	102.6929	102.6929	102.6929	102.6929	102.6929	102.6929	102.6929	102.6929	102.6929	102.6929	102.6929	102.6929
Average = Sum(39)m / 12 =												102.6929

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0814	1.0814	1.0814	1.0814	1.0814	1.0814	1.0814	1.0814	1.0814	1.0814	1.0814	1.0814
HLP (average)												1.0814
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy

2.6877 (42)

Hot water usage for mixer showers

	69.2839	68.2427	66.7255	63.8225	61.6802	59.2911	57.9332	59.4389	61.0895	63.6547	66.6200	69.0185
Hot water usage for baths	29.9176	29.4733	28.8476	27.6939	26.8300	25.8722	25.3548	25.9761	26.6526	27.6776	28.8550	29.8164
Hot water usage for other uses	42.1549	40.6220	39.0891	37.5562	36.0233	34.4904	34.4904	36.0233	37.5562	39.0891	40.6220	42.1549
Average daily hot water use (litres/day)												129.9384

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	141.3564	138.3380	134.6621	129.0726	124.5335	119.6537	117.7783	121.4383	125.2983	130.4213	136.0969	140.9898
Energy conte	223.8740	196.9914	206.9707	176.6939	167.6461	147.1282	142.4427	150.3660	154.5053	176.9805	193.8950	220.7559
Energy content (annual)										Total = Sum(45)m =		2158.2497
Distribution loss (46)m = 0.15 x (45)m	33.5811	29.5487	31.0456	26.5041	25.1469	22.0692	21.3664	22.5549	23.1758	26.5471	29.0843	33.1134

Water storage loss:

Total storage loss

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (56)

If cylinder contains dedicated solar storage

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (57)

Primary loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (59)

Combi loss 1.5610 1.4390 1.5956 1.4708 1.4792 1.3771 1.3627 1.3779 1.3503 1.4469 1.4642 1.5482 (61)

Total heat required for water heating calculated for each month

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
FV 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
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
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

Output from w/h

225.4350 198.4304 208.5663 178.1647 169.1253 148.5053 143.8053 151.7439 155.8556 178.4274 195.3592 222.3041 (64)

12Total per year (kWh/year)

Electric shower(s) 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)

Heat gains from water heating, kWh/month 74.8284 65.8594 69.2166 59.1184 56.1121 49.2644 47.7029 50.3412 51.7106 59.2077 64.8361 73.7884 (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	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	125.8056	139.2847	125.8056	129.9991	125.8056	129.9991	125.8056	125.8056	129.9991	125.8056	129.9991	125.8056
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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	247.9131	250.4856	244.0029	230.2018	212.7805	196.4068	185.4683	182.8957	189.3785	203.1795	220.6009	236.9745
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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386
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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 3.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086
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Water heating gains (Table 5)

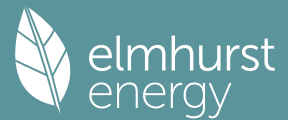
	100.5757	98.0051	93.0331	82.1089	75.4195	68.4228	64.1167	67.6629	71.8203	79.5803	90.0502	99.1780
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Total internal gains 540.6101 554.0911 529.1573 508.6256 480.3213 458.1444 438.7063 439.6798 454.5135 474.8811 506.9659 528.2737 (73)

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	4.2800	11.2829	0.3300	0.0000	0.7700	12.2707 (75)
Southeast	3.0000	36.7938	0.3300	0.0000	0.7700	28.0479 (77)
Southwest	6.4100	36.7938	0.3300	0.0000	0.7700	59.9291 (79)
Northeast	5.4800	11.2829	0.6300	0.7000	0.7700	18.8962 (75)

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Solar gains	119.1440	213.2987	319.3424	441.7713	536.8900	551.5124	524.0159	450.2240	361.2940	243.1546	144.5923	100.7425 (83)
Total gains	659.7541	767.3898	848.4997	950.3968	1017.2112	1009.6568	962.7222	889.9038	815.8075	718.0357	651.5582	629.0162 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	36.3350	36.3350	36.3350	36.3350	36.3350	36.3350	36.3350	36.3350	36.3350	36.3350	36.3350	36.3350
alpha	3.4223	3.4223	3.4223	3.4223	3.4223	3.4223	3.4223	3.4223	3.4223	3.4223	3.4223	3.4223
util living area	0.9763	0.9599	0.9315	0.8647	0.7489	0.5895	0.4500	0.5005	0.7166	0.8982	0.9617	0.9797 (86)
MIT	19.1237	19.3938	19.7759	20.2628	20.6614	20.8912	20.9673	20.9527	20.7828	20.2587	19.5968	19.0569 (87)
Th 2	20.0160	20.0160	20.0160	20.0160	20.0160	20.0160	20.0160	20.0160	20.0160	20.0160	20.0160	20.0160 (88)
util rest of house	0.9718	0.9525	0.9186	0.8390	0.7021	0.5162	0.3570	0.4048	0.6495	0.8730	0.9533	0.9758 (89)
MIT 2	17.8289	18.1694	18.6479	19.2422	19.7016	19.9374	20.0000	19.9911	19.8415	19.2513	18.4304	17.7443 (90)
Living area fraction	17.8289	18.1694	18.6479	19.2422	19.7016	19.9374	20.0000	19.9911	19.8415	19.2513	18.4304	17.7443 (90)
MIT	18.0716	18.3989	18.8593	19.4335	19.8815	20.1162	20.1813	20.1713	20.0179	19.4402	18.6491	17.9904 (92)
Temperature adjustment												-0.1500
adjusted MIT	17.9216	18.2489	18.7093	19.2835	19.7315	19.9662	20.0313	20.0213	19.8679	19.2902	18.4991	17.8404 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9581	0.9345	0.8967	0.8162	0.6870	0.5123	0.3585	0.4053	0.6382	0.8497	0.9355	0.9634 (94)
Useful gains	632.1330	717.1464	760.8198	775.6954	698.8334	517.2320	345.1217	360.7191	520.6791	610.0972	609.5103	605.9704 (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	1398.8420	1370.8364	1253.8089	1066.3084	824.7812	551.0708	352.3722	371.8832	592.3226	892.4178	1170.6034	1400.7682 (97)
Space heating kWh	570.4315	439.2797	366.7839	209.2413	93.7052	0.0000	0.0000	0.0000	0.0000	210.0465	403.9870	591.3295 (98a)
Space heating requirement - total per year (kWh/year)												2884.8047
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	570.4315	439.2797	366.7839	209.2413	93.7052	0.0000	0.0000	0.0000	0.0000	210.0465	403.9870	591.3295 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2884.8047
Space heating per m2										(98c) / (4) =		30.3792 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												88.7000 (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	570.4315	439.2797	366.7839	209.2413	93.7052	0.0000	0.0000	0.0000	0.0000	210.0465	403.9870	591.3295 (98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)
Space heating fuel (main heating system)	643.1020	495.2420	413.5106	235.8978	105.6428	0.0000	0.0000	0.0000	0.0000	236.8056	455.4532	666.6624 (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	225.4350	198.4304	208.5663	178.1647	169.1253	148.5053	143.8053	151.7439	155.8556	178.4274	195.3592	222.3041 (64)
Efficiency of water heater	84.7615	84.3923	83.7214	82.4778	80.2310	76.2000	76.2000	76.2000	76.2000	82.4852	84.1979	76.2000 (216)
Fuel for water heating, kWh/month	265.9640	235.1285	249.1193	216.0155	210.7978	194.8888	188.7209	199.1390	204.5349	216.3146	232.0238	261.8578 (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	11.3307	10.2342	11.3307	10.9652	11.3307	10.9652	11.3307	11.3307	10.9652	11.3307	10.9652	11.3307 (231)
Lighting	29.5888	23.7372	21.3727	15.6586	12.0951	9.8818	11.0336	14.3419	18.6287	24.4418	27.6070	30.4111 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-37.6572	-53.6893	-78.0210	-88.7084	-96.4844	-90.3590	-89.2731	-83.9078	-74.5173	-61.8874	-41.6249	-32.4892 (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)	-19.4465	-41.1215	-82.1282	-123.9208	-164.4001	-165.3769	-163.4035	-138.0717	-100.8495	-58.9609	-26.0150	-15.3592 (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												3252.3164 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												76.2000
Water heating fuel used												2674.5048 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:
(MEVDcentralised, Database: total watage = 4.6540, total flow = 29.0000, SFP = 0.1605)

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mechanical ventilation fans (SFP = 0.1605)	47.4099 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	133.4099 (231)
Electricity for lighting (calculated in Appendix L)	238.7984 (232)

Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1927.6727 (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	4371.3568 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3252.3164	0.2100	682.9864 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2674.5048	0.2100	561.6460 (264)
Space and water heating			1244.6325 (265)
Pumps, fans and electric keep-hot	133.4099	0.1432	18.8939 (267)
Energy for lighting	238.7984	0.1490	35.5857 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-828.6190	0.1387	-114.9243
PV Unit electricity exported	-1099.0538	0.1258	-138.2206
Total			-253.1449 (269)
Total CO2, kg/year			1045.9671 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.0100 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3252.3164	1.1300	3675.1176 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2674.5048	1.1300	3022.1905 (278)
Space and water heating			6697.3080 (279)
Pumps, fans and electric keep-hot	133.4099	1.5335	203.6088 (281)
Energy for lighting	238.7984	1.5547	371.2705 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-828.6190	1.5170	-1257.0366
PV Unit electricity exported	-1099.0538	0.4616	-507.3580
Total			-1764.3946 (283)
Total Primary energy kWh/year			5507.7927 (286)
Dwelling Primary energy Rate (DPER)			58.0000 (287)

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

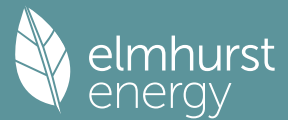
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	47.4800 (1b)	x 2.5000 (2b)	= 118.7000 (1b) - (3b)
First floor	47.4800 (1c)	x 2.6000 (2c)	= 123.4480 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	242.1480 (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) = 0.1239 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3739 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3178 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4052	0.3973	0.3893	0.3496	0.3416	0.3019	0.3019	0.2940	0.3178	0.3416	0.3575	0.3734 (22b)
	0.5821	0.5789	0.5758	0.5611	0.5584	0.5456	0.5456	0.5432	0.5505	0.5584	0.5639	0.5697 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.1600	1.0000	2.1600		(26)
TER Opening Type			19.1700	1.1450	21.9504		(27)
GF			47.4800	0.1300	6.1724		(28a)
Main	115.6680	21.3300	94.3380	0.1800	16.9808		(29a)
PIJ	47.4800		47.4800	0.1100	5.2228		(30)
Total net area of external elements Aum(A, m2)			210.6280				(31)
Fabric heat loss, W/K = Sum (A x U)					52.4864		(33)
Main dwelling							
Party Wall 1			28.2200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							141.4578 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				14.8700	0.0500	0.7435	
E3 Sill				14.8700	0.0500	0.7435	
E4 Jamb				36.4200	0.0500	1.8210	
E5 Ground floor (normal)				22.6800	0.1600	3.6288	
E6 Intermediate floor within a dwelling				22.6800	0.0000	0.0000	
E16 Corner (normal)				10.1900	0.0900	0.9171	
E18 Party wall between dwellings				10.1900	0.0600	0.6114	
P1 Party wall - Ground floor				5.5400	0.0800	0.4432	
P4 Party wall - Roof (insulation at ceiling level)				5.5400	0.1200	0.6648	
E10 Eaves (insulation at ceiling level)				17.1400	0.0600	1.0284	
E12 Gable (insulation at ceiling level)				5.5400	0.0600	0.3324	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.9341 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	63.4205 (37)

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

(38)m	Jan 46.5146	Feb 46.2598	Mar 46.0101	Apr 44.8373	May 44.6179	Jun 43.5964	Jul 43.5964	Aug 43.4073	Sep 43.9899	Oct 44.6179	Nov 45.0618	Dec 45.5259 (38)
Heat transfer coeff	109.9351	109.6803	109.4307	108.2578	108.0384	107.0169	107.0169	106.8278	107.4104	108.0384	108.4823	108.9464 (39)
Average = Sum(39)m / 12 =												108.2568
HLP	Jan 1.1577	Feb 1.1550	Mar 1.1524	Apr 1.1400	May 1.1377	Jun 1.1270	Jul 1.1270	Aug 1.1250	Sep 1.1311	Oct 1.1377	Nov 1.1424	Dec 1.1473 (40)
HLP (average)												1.1400
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

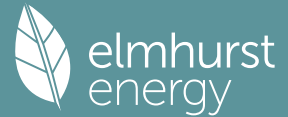
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6877 (42)
Hot water usage for mixer showers												
69.2839	68.2427	66.7255	63.8225	61.6802	59.2911	57.9332	59.4389	61.0895	63.6547	66.6200	69.0185	(42a)
Hot water usage for baths												
29.9176	29.4733	28.8476	27.6939	26.8300	25.8722	25.3548	25.9761	26.6526	27.6776	28.8550	29.8164	(42b)
Hot water usage for other uses												
42.1549	40.6220	39.0891	37.5562	36.0233	34.4904	34.4904	36.0233	37.5562	39.0891	40.6220	42.1549	(42c)
Average daily hot water use (litres/day)												129.9384 (43)
Daily hot water use	Jan 141.3564	Feb 138.3380	Mar 134.6621	Apr 129.0726	May 124.5335	Jun 119.6537	Jul 117.7783	Aug 121.4383	Sep 125.2983	Oct 130.4213	Nov 136.0969	Dec 140.9898 (44)
Energy conte	223.8740	196.9914	206.9707	176.6939	167.6461	147.1282	142.4427	150.3660	154.5053	176.9805	193.8950	220.7559 (45)
Energy content (annual)										Total = Sum(45)m =		2158.2497
Distribution loss (46)m = 0.15 x (45)m												
33.5811	29.5487	31.0456	26.5041	25.1469	22.0692	21.3664	22.5549	23.1758	26.5471	29.0843	33.1134	(46)
Water storage loss:												
Total storage loss												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	(61)
Total heat required for water heating calculated for each month												
274.8329	243.0188	257.9296	226.0090	218.6050	196.4432	193.4016	201.3249	203.8204	227.9394	243.2101	271.7149	(62)
WWHRS	-31.6737	-28.0125	-29.3331	-24.2889	-22.6364	-19.3701	-18.1564	-19.3075	-20.0411	-23.6262	-26.7657	-31.0872 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	243.1592	215.0063	228.5965	201.7201	195.9686	177.0731	175.2452	182.0173	183.7793	204.3131	216.4444	240.6277 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2463.9507 (64)
Electric shower(s)												2464 (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)
Heat gains from water heating, kWh/month	87.1778	77.0065	81.5575	71.0795	68.4820	61.2489	60.1019	62.7364	63.7018	71.5857	76.7989	86.1411 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan 134.3858	Feb 134.3858	Mar 134.3858	Apr 134.3858	May 134.3858	Jun 134.3858	Jul 134.3858	Aug 134.3858	Sep 134.3858	Oct 134.3858	Nov 134.3858	Dec 134.3858 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
125.8056	139.2847	125.8056	129.9991	125.8056	129.9991	125.8056	125.8056	129.9991	125.8056	129.9991	125.8056	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
247.9131	250.4856	244.0029	230.2018	212.7805	196.4068	185.4683	182.8957	189.3785	203.1795	220.6009	236.9745	(68)

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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5											
Pumps, fans	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386 (69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086 (71)
Total internal gains	117.1745	114.5930	109.6203	98.7215	92.0458	85.0679	80.7821	84.3231	88.4747	96.2174	106.6651 (72)
	557.2089	570.6791	545.7444	525.2381	496.9475	474.7895	455.3717	456.3401	471.1680	491.5182	523.5808 (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				9.7600	11.2829	0.6300		0.7000		0.7700		33.6546 (75)	
Southeast				3.0000	36.7938	0.6300		0.7000		0.7700		33.7340 (77)	
Southwest				6.4100	36.7938	0.6300		0.7000		0.7700		72.0784 (79)	
Solar gains	139.4669	248.7425	370.0329	508.2580	614.7185	630.2550	599.3176	516.8384	417.4194	282.9193	169.0850	118.0374	(83)
Total gains	696.6758	819.4216	915.7773	1033.4962	1111.6660	1105.0446	1054.6893	973.1785	888.5873	774.4375	692.6658	662.9142	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	33.9413	34.0202	34.0978	34.4672	34.5372	34.8668	34.8668	34.9286	34.7391	34.5372	34.3959	34.2493
alpha	3.2628	3.2680	3.2732	3.2978	3.3025	3.3245	3.3245	3.3286	3.3159	3.3025	3.2931	3.2833
util living area	0.9733	0.9547	0.9227	0.8488	0.7274	0.5648	0.4290	0.4778	0.6944	0.8861	0.9567	0.9770 (86)
MIT	19.0141	19.3118	19.7258	20.2543	20.6617	20.8949	20.9681	20.9543	20.7856	20.2457	19.5442	18.9657 (87)
Th 2	19.9540	19.9562	19.9583	19.9683	19.9701	19.9789	19.9789	19.9805	19.9755	19.9701	19.9664	19.9624 (88)
util rest of house	0.9682	0.9463	0.9081	0.8205	0.6779	0.4906	0.3364	0.3822	0.6245	0.8582	0.9473	0.9726 (89)
MIT 2	17.6510	18.0269	18.5451	19.1938	19.6606	19.9044	19.9637	19.9570	19.8066	19.2006	18.3316	17.5951 (90)
Living area fraction	FLA = Living area / (4) =											
MIT	17.9065	18.2677	18.7664	19.3926	19.8483	20.0901	20.1520	20.1440	19.9901	19.3965	18.5589	17.8520 (92)
Temperature adjustment	0.0000											
adjusted MIT	17.9065	18.2677	18.7664	19.3926	19.8483	20.0901	20.1520	20.1440	19.9901	19.3965	18.5589	17.8520 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9541	0.9281	0.8871	0.8022	0.6715	0.4991	0.3526	0.3982	0.6256	0.8392	0.9298	0.9597 (94)
Useful gains	664.6814	760.5156	812.3553	829.0468	746.5119	551.4937	371.8482	387.4847	555.8575	649.9059	644.0092	636.1983 (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	1495.8335	1466.1778	1342.3241	1135.9015	880.3266	587.5305	380.1222	399.9609	632.6550	950.3611	1243.0879	1487.3385 (97)
Space heating kWh	618.3772	474.2050	394.2968	220.9354	99.5581	0.0000	0.0000	0.0000	0.0000	223.5386	431.3367	633.2484 (98a)
Space heating requirement - total per year (kWh/year)	3095.4962											
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	618.3772	474.2050	394.2968	220.9354	99.5581	0.0000	0.0000	0.0000	0.0000	223.5386	431.3367	633.2484 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	3095.4962											
Space heating per m2	(98c) / (4) = 32.5979 (99)											

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)											
Fraction of space heat from main system(s)	1.0000 (202)											
Efficiency of main space heating system 1 (in %)	92.4000 (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	618.3772	474.2050	394.2968	220.9354	99.5581	0.0000	0.0000	0.0000	0.0000	223.5386	431.3367	633.2484 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	669.2394	513.2088	426.7281	239.1076	107.7469	0.0000	0.0000	0.0000	0.0000	241.9249	466.8146	685.3337 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	243.1592	215.0063	228.5965	201.7201	195.9686	177.0731	175.2452	182.0173	183.7793	204.3131	216.4444	240.6277 (64)
Efficiency of water heater (217)m	86.2916	86.0258	85.5380	84.5769	83.0051	80.3000	80.3000	80.3000	80.3000	84.5746	85.8286	80.3000 (216)
Fuel for water heating, kWh/month	281.7876	249.9323	267.2456	238.5050	236.0922	220.5144	218.2381	226.6717	228.8659	241.5774	252.1821	278.6545 (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	26.1399	20.9704	18.8815	13.8334	10.6853	8.7300	9.7475	12.6702	16.4573	21.5929	24.3891	26.8664 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-43.6361	-61.1225	-87.2962	-97.4949	-104.5599	-97.3606	-96.1130	-90.9815	-81.8863	-69.5333	-47.8138	-37.7690 (233a)

Full SAP Calculation Printout



Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-25.8839	-54.3035	-107.6752	-161.3674	-213.0502	-213.9815	-211.5046	-179.2642	-131.6115	-77.5919	-34.5334	-20.4833	(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												3350.1041	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2940.2667	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												210.9640	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2346.8179	(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												4240.5169	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3350.1041	0.2100	703.5219	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2940.2667	0.2100	617.4560	(264)
Space and water heating			1320.9779	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	210.9640	0.1443	30.4486	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-915.5672	0.1347	-123.3569	
PV Unit electricity exported	-1431.2508	0.1260	-180.2751	
Total			-303.6320	(269)
Total CO2, kg/year			1059.7237	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.1600	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3350.1041	1.1300	3785.6176	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2940.2667	1.1300	3322.5014	(278)
Space and water heating			7108.1190	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	210.9640	1.5338	323.5837	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-915.5672	1.4980	-1371.4810	
PV Unit electricity exported	-1431.2508	0.4623	-661.7371	
Total			-2033.2181	(283)
Total Primary energy kWh/year			5528.5853	(286)
Target Primary Energy Rate (TPER)			58.2200	(287)

Predicted Energy Assessment



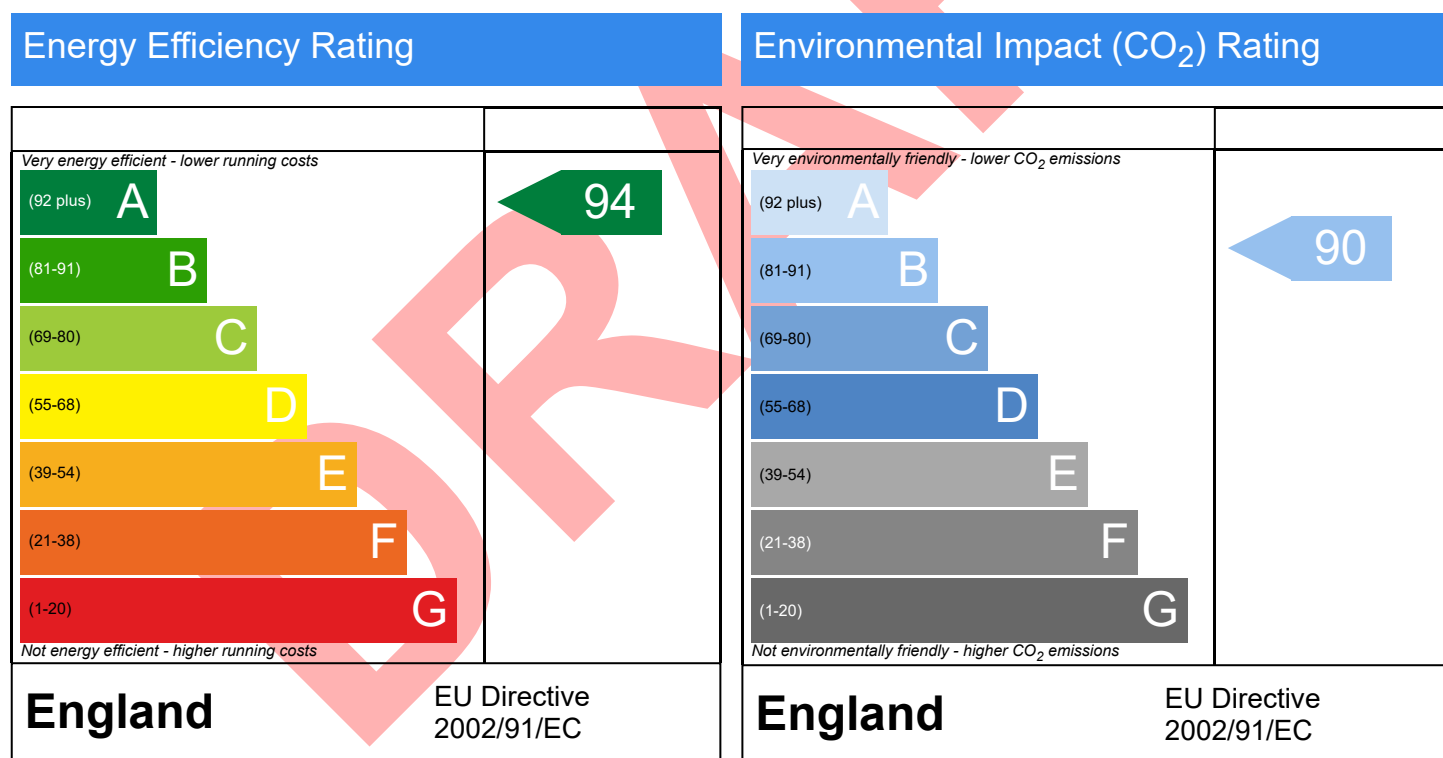
Highmoor Lane, CLECKHEATON, BD19 6LW

Dwelling type:
Date of assessment:
Produced by:
Total floor area:
DRRN:

House, Semi-Detached
07/05/2025
Paul Goddard
94.96 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

Energy Report



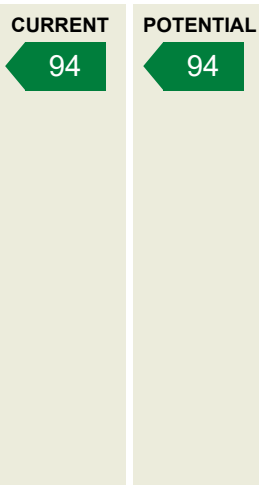
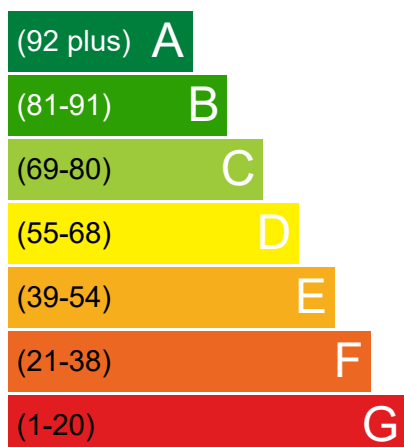
Dwelling Address	Highmoor Lane, CLECKHEATON, BD19 6LW
Reference	HT10-Semi-001
Assessment Date	07/05/2025
Submission Date	
Property Type	House, Semi-Detached
Total Floor Area	95

This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

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

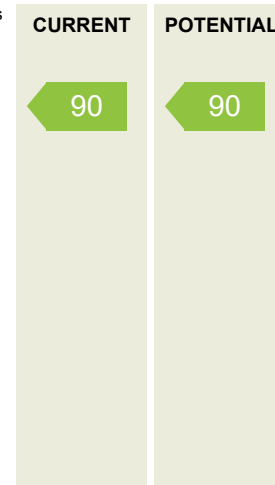
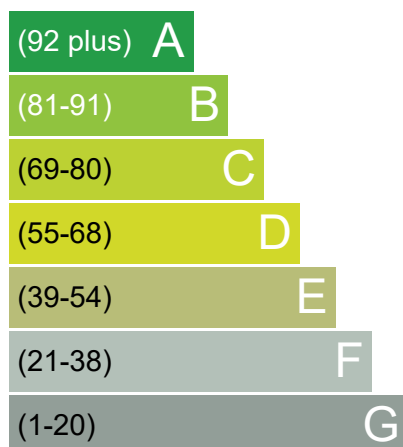
Energy Efficiency Rating

Most energy efficient - lower running costs

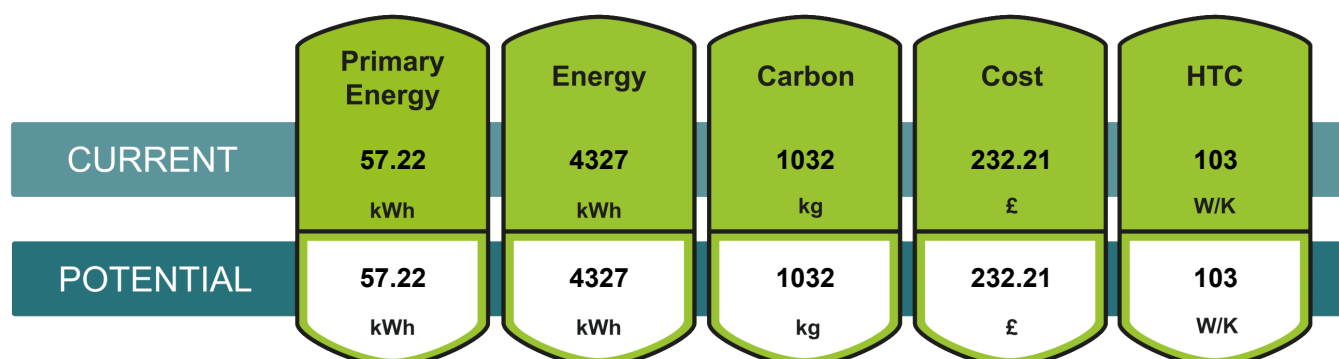


Carbon Dioxide (CO2) Emissions Rating

Very environmentally friendly - lower CO2 emissions



Additional ratings for your home



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 0.18 W/m ² K	Very Good
Roof	Average thermal transmittance 0.09 W/m ² K	Very Good
Floor	Average thermal transmittance 0.11 W/m ² K	Very Good
Windows	High performance glazing	Good
Main heating	Boiler and radiators, mains gas	Very Good
Main heating controls	Time and temperature zone control	Very Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 4.0 m ³ /h.m ² (assumed)	Good

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 measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating
Solar water heating	£19	A 94			A 92

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

		Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting		£71	£71	
Heating		£313	£313	
Hot Water		£150	£150	
New Technologies e.g. Impact of PV		-(£301)	-(£301)	
TOTAL		£232	£232	

Estimated energy use and potential savings



Space Heating

3145

kWh per year



Water Heating

2676

kWh per year

About this document

Created by:
Company/Trading name:
Phone number:
Email address:

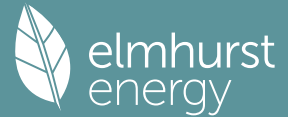
Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g. heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO ₂)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Full SAP Calculation Printout



Property Reference	HT11-Det			Issued on Date	07/05/2025
Assessment Reference	001	Prop Type Ref			
Property	Highmoor Lane, CLECKHEATON, BD19 6LW				
SAP Rating	94 A	DER	11.37	TER	11.95
Environmental	90 B	% DER < TER			4.85
CO ₂ Emissions (t/year)	1.07	DFEE	41.55	TFEE	41.79
Compliance Check	See BREL	% DFEE < TFEE			0.59
% DPER < TPER	4.24	DPER	59.88	TPER	62.53
Assessor Details	Mr. Paul Goddard			Assessor ID	B342-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	47.4800 (1b)	x 2.5000 (2b)	= 118.7000 (1b) - (3b)
First floor	47.4800 (1c)	x 2.6000 (2c)	= 123.4480 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 242.1480 (5)

2. Ventilation rate

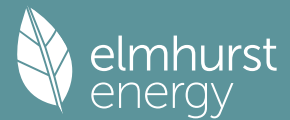
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.2000 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1700 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			2.1600	1.0000	2.1600		(26)
Window			13.2400	1.1450	15.1603		(27)
Patio Door			3.3300	1.3258	4.4148		(27)
GF			47.4800	0.1200	5.6976	9.0000	427.3200 (28a)
Main	143.9220	18.7300	125.1920	0.1800	22.5346	18.0000	2253.4559 (29a)
PIJ	47.4800		47.4800	0.0900	4.2732	9.0000	427.3200 (30)
Total net area of external elements Aum(A, m ²)			238.8820				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	54.2404		(33)
Main dwelling							
Internal Wall 1			120.4500			75.0000	9033.7498 (32c)
Internal Floor 1			47.4100			18.0000	853.3800 (32d)
Internal Ceiling 1			47.4800			9.0000	427.3200 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13422.5457 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							141.3495 (35)

Full SAP Calculation Printout



List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	13.9700	0.0500	0.6985
E3 Sill	13.9700	0.0500	0.6985
E4 Jamb	35.3200	0.0500	1.7660
E5 Ground floor (normal)	28.2200	0.1000	2.8220
E6 Intermediate floor within a dwelling	28.2200	0.0700	1.9754
E16 Corner (normal)	20.3800	0.0900	1.8342
E10 Eaves (insulation at ceiling level)	17.1400	0.0600	1.0284
E12 Gable (insulation at ceiling level)	11.0800	0.0600	0.6648

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.4878 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 65.7282 (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	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544	
Average = Sum(39)m / 12 =	105.6827	105.6827	105.6827	105.6827	105.6827	105.6827	105.6827	105.6827	105.6827	105.6827	105.6827	105.6827	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(40)
HLP (average)	1.1129	1.1129	1.1129	1.1129	1.1129	1.1129	1.1129	1.1129	1.1129	1.1129	1.1129	1.1129	
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6877 (42)
Hot water usage for mixer showers													
69.2839	68.2427	66.7255	63.8225	61.6802	59.2911	57.9332	59.4389	61.0895	63.6547	66.6200	69.0185	69.0185	(42a)
Hot water usage for baths													
29.9176	29.4733	28.8476	27.6939	26.8300	25.8722	25.3548	25.9761	26.6526	27.6776	28.8550	29.8164	29.8164	(42b)
Hot water usage for other uses													
42.1549	40.6220	39.0891	37.5562	36.0233	34.4904	34.4904	36.0233	37.5562	39.0891	40.6220	42.1549	42.1549	(42c)
Average daily hot water use (litres/day)													129.9384 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	141.3564	138.3380	134.6621	129.0726	124.5335	119.6537	117.7783	121.4383	125.2983	130.4213	136.0969	140.9898	(44)
Energy content (annual)	223.8740	196.9914	206.9707	176.6939	167.6461	147.1282	142.4427	150.3660	154.5053	176.9805	193.8950	220.7559	(45)
Distribution loss (46)m = 0.15 x (45)m													
33.5811	29.5487	31.0456	26.5041	25.1469	22.0692	21.3664	22.5549	23.1758	26.5471	29.0843	33.1134	33.1134	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	1.5610	1.4390	1.5956	1.4708	1.4792	1.3771	1.3627	1.3779	1.3503	1.4469	1.4642	1.5482	(61)
Total heat required for water heating calculated for each month	225.4350	198.4304	208.5663	178.1647	169.1253	148.5053	143.8053	151.7439	155.8556	178.4274	195.3592	222.3041	(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	225.4350	198.4304	208.5663	178.1647	169.1253	148.5053	143.8053	151.7439	155.8556	178.4274	195.3592	222.3041	(64)
12Total per year (kWh/year)													2175.7225 (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	74.8284	65.8594	69.2166	59.1184	56.1121	49.2644	47.7029	50.3412	51.7106	59.2077	64.8361	73.7884	(65)

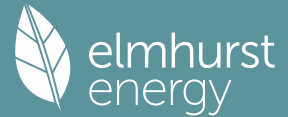
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	128.3738	142.1281	128.3738	132.6529	128.3738	132.6529	128.3738	128.3738	132.6529	128.3738	132.6529	128.3738	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	247.9131	250.4856	244.0029	230.2018	212.7805	196.4068	185.4683	182.8957	189.3785	203.1795	220.6009	236.9745	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	(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)	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	(71)
Water heating gains (Table 5)	100.5757	98.0051	93.0331	82.1089	75.4195	68.4228	64.1167	67.6629	71.8203	79.5803	90.0502	99.1780	(72)
Total internal gains	543.1783	556.9346	531.7255	511.2794	482.8895	460.7983	441.2745	442.2481	457.1674	477.4493	509.6197	530.8420	(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					3.2500	11.2829	0.3300	0.0000			0.7700			9.3177 (75)
Southwest					4.7000	36.7938	0.3300	0.0000			0.7700			43.9418 (79)
Northwest					5.2900	11.2829	0.3300	0.0000			0.7700			15.1664 (81)
Northeast					3.3300	11.2829	0.6300	0.7000			0.7700			11.4826 (75)
Solar gains	79.9085	148.0603	234.3152	343.5164	433.3151	451.5362	426.4423	356.1837	271.6166	172.1941	97.8875			66.9772 (83)
Total gains	623.0868	704.9949	766.0407	854.7958	916.2046	912.3345	867.7168	798.4318	728.7840	649.6435	607.5073	597.8192	(84)	

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7. Mean internal temperature (heating season)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	35.2800	35.2800	35.2800	35.2800	35.2800	35.2800	35.2800	35.2800	35.2800	35.2800	35.2800	35.2800	21.0000 (85)
alpha	3.3520	3.3520	3.3520	3.3520	3.3520	3.3520	3.3520	3.3520	3.3520	3.3520	3.3520	3.3520	
util living area	0.9801	0.9688	0.9485	0.8961	0.7965	0.6448	0.5030	0.5578	0.7704	0.9219	0.9689	0.9826	(86)
MIT	18.9944	19.2303	19.5999	20.1089	20.5602	20.8469	20.9504	20.9292	20.7086	20.1309	19.4703	18.9356	(87)
Th 2	19.9903	19.9903	19.9903	19.9903	19.9903	19.9903	19.9903	19.9903	19.9903	19.9903	19.9903	19.9903	(88)
util rest of house	0.9762	0.9628	0.9382	0.8742	0.7527	0.5689	0.4001	0.4538	0.7062	0.9009	0.9619	0.9792	(89)
MIT 2	17.6493	17.9479	18.4139	19.0431	19.5745	19.8774	19.9656	19.9521	19.7499	19.0825	18.2558	17.5748	(90)
Living area fraction									fLA = Living area / (4) =			0.1874	(91)
MIT	17.9014	18.1883	18.6362	19.2429	19.7592	20.0591	20.1502	20.1353	19.9296	19.2790	18.4835	17.8299	(92)
Temperature adjustment												-0.1500	
adjusted MIT	17.7514	18.0383	18.4862	19.0929	19.6092	19.9091	20.0002	19.9853	19.7796	19.1290	18.3335	17.6799	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9636	0.9464	0.9175	0.8501	0.7337	0.5622	0.4012	0.4532	0.6907	0.8773	0.9454	0.9677	(94)
Useful gains	600.4174	667.2331	702.8645	726.6736	672.2161	512.9320	348.1359	361.8704	503.3555	569.9544	574.3112	578.4907	(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	1421.5849	1388.4853	1266.7372	1077.2149	835.8688	561.0797	359.3404	378.9019	600.2358	901.3672	1187.1815	1424.5872	(97)
Space heating kWh	610.9486	484.6815	419.5213	252.3897	121.7576	0.0000	0.0000	0.0000	0.0000	246.5711	441.2666	629.4957	(98a)
Space heating requirement - total per year (kWh/year)												3206.6321	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	610.9486	484.6815	419.5213	252.3897	121.7576	0.0000	0.0000	0.0000	0.0000	246.5711	441.2666	629.4957	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3206.6321	
Space heating per m2										(98c) / (4) =		33.7682	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)
Fraction of space heat from main system(s)
Efficiency of main space heating system 1 (in %)
Efficiency of main space heating system 2 (in %)
Efficiency of secondary/supplementary heating system, %

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	610.9486	484.6815	419.5213	252.3897	121.7576	0.0000	0.0000	0.0000	0.0000	246.5711	441.2666	629.4957	(98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000	(210)
Space heating fuel (main heating system)	688.7808	546.4278	472.9665	284.5431	137.2690	0.0000	0.0000	0.0000	0.0000	277.9832	497.4820	709.6908	(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	225.4350	198.4304	208.5663	178.1647	169.1253	148.5053	143.8053	151.7439	155.8556	178.4274	195.3592	222.3041	(64)
Efficiency of water heater (217)m	84.9442	84.6656	84.1179	83.0617	80.9767	76.2000	76.2000	76.2000	76.2000	82.9848	84.4489	85.0585	(216)
Fuel for water heating, kWh/month	265.3919	234.3696	247.9452	214.4969	208.8568	194.8888	188.7209	199.1390	204.5349	215.0120	231.3342	261.3545	(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	11.3307	10.2342	11.3307	10.9652	11.3307	10.9652	11.3307	11.3307	10.9652	11.3307	10.9652	11.3307	(231)
Lighting	30.1928	24.2218	21.8090	15.9782	12.3421	10.0836	11.2588	14.6347	19.0090	24.9408	28.1706	31.0320	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-42.4772	-59.8154	-85.8610	-96.3886	-103.8033	-96.8480	-95.6895	-90.4479	-81.1060	-68.3937	-46.6921	-36.7354	(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	-24.1437	-50.7972	-100.9797	-151.6787	-200.5618	-201.5106	-199.0999	-168.5282	-123.4886	-72.5961	-32.2211	-19.0877	(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												3615.1433	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												76.2000	
Water heating fuel used												2666.0447	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:
(MEV)Decentralised, Database: total watage = 4.6540, total flow = 29.0000, SFP = 0.1605)
mechanical ventilation fans (SFP = 0.1605)
central heating pump
main heating flue fan
Total electricity for the above, kWh/year

47.4099 (230a)
41.0000 (230c)
45.0000 (230e)
133.4099 (231)

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Electricity for lighting (calculated in Appendix L)	243.6733 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2248.9515 (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	4409.3197 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3615.1433	0.2100	759.1801 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2666.0447	0.2100	559.8694 (264)
Space and water heating			1319.0495 (265)
Pumps, fans and electric keep-hot	133.4099	0.1432	18.8939 (267)
Energy for lighting	243.6733	0.1490	36.3121 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-904.2581	0.1390	-125.6606
PV Unit electricity exported	-1344.6934	0.1259	-169.2925
Total			-294.9531 (269)
Total CO2, kg/year			1079.3024 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.3700 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3615.1433	1.1300	4085.1119 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2666.0447	1.1300	3012.6305 (278)
Space and water heating			7097.7424 (279)
Pumps, fans and electric keep-hot	133.4099	1.5335	203.6088 (281)
Energy for lighting	243.6733	1.5547	378.8497 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-904.2581	1.5180	-1372.6812
PV Unit electricity exported	-1344.6934	0.4621	-621.4202
Total			-1994.1013 (283)
Total Primary energy kWh/year			5686.0996 (286)
Dwelling Primary energy Rate (DPER)			59.8800 (287)

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

1. Overall dwelling characteristics

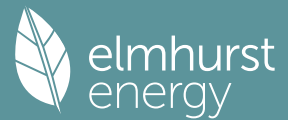
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	47.4800 (1b)	x 2.5000 (2b)	= 118.7000 (1b) - (3b)
First floor	47.4800 (1c)	x 2.6000 (2c)	= 123.4480 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	242.1480 (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) = 0.1239 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3739 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3178 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												

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Effective ac	0.4052	0.3973	0.3893	0.3496	0.3416	0.3019	0.3019	0.2940	0.3178	0.3416	0.3575	0.3734 (22b)
	0.5821	0.5789	0.5758	0.5611	0.5584	0.5456	0.5456	0.5432	0.5505	0.5584	0.5639	0.5697 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.1600	1.0000	2.1600		(26)
TER Opening Type			16.5700	1.1450	18.9733		(27)
GF			47.4800	0.1300	6.1724		(28a)
Main	143.9220	18.7300	125.1920	0.1800	22.5346		(29a)
PIJ	47.4800		47.4800	0.1100	5.2228		(30)
Total net area of external elements Aum (A, m2)			238.8820				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	55.0630		(33)

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

141.3495 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	13.9700	0.0500	0.6985
E3 Sill	13.9700	0.0500	0.6985
E4 Jamb	35.3200	0.0500	1.7660
E5 Ground floor (normal)	28.2200	0.1600	4.5152
E6 Intermediate floor within a dwelling	28.2200	0.0000	0.0000
E16 Corner (normal)	20.3800	0.0900	1.8342
E10 Eaves (insulation at ceiling level)	17.1400	0.0600	1.0284
E12 Gable (insulation at ceiling level)	11.0800	0.0600	0.6648
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.2056 (36)
Point Thermal Bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	66.2686 (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	46.5146	46.2598	46.0101	44.8373	44.6179	43.5964	43.5964	43.4073	43.9899	44.6179	45.0618	45.5259 (38)
Heat transfer coeff	112.7832	112.5285	112.2788	111.1060	110.8865	109.8651	109.8651	109.6759	110.2585	110.8865	111.3304	111.7945 (39)
Average = Sum(39)m / 12 =												111.1049

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1877	1.1850	1.1824	1.1700	1.1677	1.1570	1.1570	1.1550	1.1611	1.1677	1.1724	1.1773 (40)
HLP (average)												1.1700
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

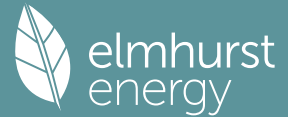
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6877 (42)
Hot water usage for mixer showers	69.2839	68.2427	66.7255	63.8225	61.6802	59.2911	57.9332	59.4389	61.0895	63.6547	66.6200	69.0185 (42a)
Hot water usage for baths	29.9176	29.4733	28.8476	27.6939	26.8300	25.8722	25.3548	25.9761	26.6526	27.6776	28.8550	29.8164 (42b)
Hot water usage for other uses	42.1549	40.6220	39.0891	37.5562	36.0233	34.4904	34.4904	36.0233	37.5562	39.0891	40.6220	42.1549 (42c)
Average daily hot water use (litres/day)												129.9384 (43)
Daily hot water use	141.3564	138.3380	134.6621	129.0726	124.5335	119.6537	117.7783	121.4383	125.2983	130.4213	136.0969	140.9898 (44)
Energy conte	223.8740	196.9914	206.9707	176.6939	167.6461	147.1282	142.4427	150.3660	154.5053	176.9805	193.8950	220.7559 (45)
Energy content (annual)										Total = Sum(45)m =		2158.2497
Distribution loss (46)m = 0.15 x (45)m	33.5811	29.5487	31.0456	26.5041	25.1469	22.0692	21.3664	22.5549	23.1758	26.5471	29.0843	33.1134 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	274.8329	243.0188	257.9296	226.0090	218.6050	196.4432	193.4016	201.3249	203.8204	227.9394	243.2101	271.7149 (62)
WWHRS	-31.6737	-28.0125	-29.3331	-24.2889	-22.6364	-19.3701	-18.1564	-19.3075	-20.0411	-23.6262	-26.7657	-31.0872 (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	243.1592	215.0063	228.5965	201.7201	195.9686	177.0731	175.2452	182.0173	183.7793	204.3131	216.4444	240.6277 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2463.9507 (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	87.1778	77.0065	81.5575	71.0795	68.4820	61.2489	60.1019	62.7364	63.7018	71.5857	76.7989	86.1411 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	128.3738	142.1281	128.3738	132.6529	128.3738	132.6529	128.3738	128.3738	132.6529	128.3738	132.6529	128.3738 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	247.9131	250.4856	244.0029	230.2018	212.7805	196.4068	185.4683	182.8957	189.3785	203.1795	220.6009	236.9745 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386 (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)	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086 (71)
Water heating gains (Table 5)	117.1745	114.5930	109.6203	98.7215	92.0458	85.0679	80.7821	84.3231	88.4747	96.2174	106.6651	115.7810 (72)
Total internal gains	559.7771	573.5225	548.3127	527.8920	499.5157	477.4434	457.9399	458.9084	473.8218	494.0864	526.2346	547.4450 (73)

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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	6.5800		11.2829		0.6300		0.7000		0.7700		22.6892 (75)	
Southwest	4.7000		36.7938		0.6300		0.7000		0.7700		52.8500 (79)	
Northwest	5.2900		11.2829		0.6300		0.7000		0.7700		18.2410 (81)	
Solar gains	93.7803	173.3378	273.2802	399.1363	502.3139	522.9831	494.0983	413.4079	316.2782	201.3119	114.8030	78.6543 (83)
Total gains	653.5574	746.8604	821.5929	927.0283	1001.8296	1000.4265	952.0382	872.3163	790.1001	695.3984	641.0376	626.0993 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	33.0589	33.1337	33.2074	33.5579	33.6243	33.9369	33.9369	33.9955	33.8158	33.6243	33.4903	33.3512
alpha	3.2039	3.2089	3.2138	3.2372	3.2416	3.2625	3.2625	3.2664	3.2544	3.2416	3.2327	3.2234
util living area	0.9778	0.9649	0.9417	0.8825	0.7752	0.6178	0.4788	0.5332	0.7503	0.9128	0.9652	0.9805 (86)
MIT	18.8820	19.1418	19.5439	20.0999	20.5642	20.8540	20.9526	20.9324	20.7120	20.1127	19.4127	18.8422 (87)
Th 2	19.9299	19.9320	19.9341	19.9441	19.9459	19.9546	19.9546	19.9562	19.9512	19.9459	19.9421	19.9382 (88)
util rest of house	0.9734	0.9581	0.9300	0.8581	0.7282	0.5402	0.3762	0.4287	0.6825	0.8894	0.9573	0.9767 (89)
MIT 2	17.4695	17.7991	18.3063	18.9969	19.5401	19.8492	19.9317	19.9208	19.7182	19.0283	18.1525	17.4240 (90)
Living area fraction	17.7343	18.0508	18.5383	19.2037	19.7321	20.0376	20.1231	20.1104	19.9045	19.2316	18.3887	17.6899 (92)
Temperature adjustment												0.0000
adjusted MIT	17.7343	18.0508	18.5383	19.2037	19.7321	20.0376	20.1231	20.1104	19.9045	19.2316	18.3887	17.6899 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9604	0.9415	0.9097	0.8374	0.7175	0.5468	0.3935	0.4451	0.6791	0.8692	0.9410	0.9648 (94)
Useful gains	627.6756	703.1799	747.4393	776.3237	718.8077	547.0474	374.6038	388.2277	536.5293	604.4168	603.2146	604.0314 (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	1515.1598	1479.8407	1351.6422	1144.8020	890.6480	597.3980	387.0608	406.9409	639.9971	957.1260	1256.7782	1508.0936 (97)
Space heating kWh	660.2883	521.9160	449.5269	265.3044	127.8492	0.0000	0.0000	0.0000	0.0000	262.4157	470.5658	672.6222 (98a)
Space heating requirement - total per year (kWh/year)												3430.4885
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	660.2883	521.9160	449.5269	265.3044	127.8492	0.0000	0.0000	0.0000	0.0000	262.4157	470.5658	672.6222 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3430.4885
Space heating per m ²										(98c) / (4) =		36.1256 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (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	660.2883	521.9160	449.5269	265.3044	127.8492	0.0000	0.0000	0.0000	0.0000	262.4157	470.5658	672.6222 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	714.5977	564.8442	486.5010	287.1259	138.3650	0.0000	0.0000	0.0000	0.0000	283.9996	509.2703	727.9461 (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	243.1592	215.0063	228.5965	201.7201	195.9686	177.0731	175.2452	182.0173	183.7793	204.3131	216.4444	240.6277 (64)
Efficiency of water heater (217)m	86.4092	86.2063	85.8023	84.9694	83.4888	80.3000	80.3000	80.3000	80.3000	84.9188	85.9983	80.3000 (216)
Fuel for water heating, kWh/month	281.4041	249.4091	266.4224	237.4031	234.7245	220.5144	218.2381	226.6717	228.8659	240.5983	251.6846	278.3104 (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	26.6735	21.3985	19.2670	14.1158	10.9035	8.9082	9.9465	12.9288	16.7933	22.0337	24.8870	27.4149 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-43.6531	-61.1513	-87.3400	-97.5430	-104.6074	-97.4028	-96.1601	-91.0357	-81.9414	-69.5763	-47.8369	-37.7835 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-25.8670	-54.2747	-107.6314	-161.3194	-213.0027	-213.9394	-211.4575	-179.2100	-131.5565	-77.5488	-34.5103	-20.4688 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												

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(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												3712.6499	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2934.2465	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												215.2708	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2346.8179	(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												4601.3492	(238)

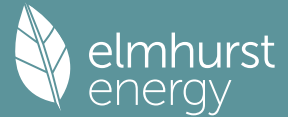
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3712.6499	0.2100	779.6565	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2934.2465	0.2100	616.1918	(264)
Space and water heating			1395.8482	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	215.2708	0.1443	31.0702	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-916.0315	0.1347	-123.4189	
PV Unit electricity exported	-1430.7865	0.1260	-180.2126	
Total			-303.6315	(269)
Total CO2, kg/year			1135.2162	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.9500	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3712.6499	1.1300	4195.2944	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2934.2465	1.1300	3315.6986	(278)
Space and water heating			7510.9930	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	215.2708	1.5338	330.1895	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-916.0315	1.4980	-1372.1744	
PV Unit electricity exported	-1430.7865	0.4623	-661.5074	
Total			-2033.6818	(283)
Total Primary energy kWh/year			5937.6014	(286)
Target Primary Energy Rate (TPER)			62.5300	(287)

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Property Reference	HT11-Det			Issued on Date	07/05/2025
Assessment Reference	001	Prop Type Ref			
Property	Highmoor Lane, CLECKHEATON, BD19 6LW				
SAP Rating	94 A	DER	11.37	TER	11.95
Environmental	90 B	% DER < TER			4.85
CO ₂ Emissions (t/year)	1.07	DFEE	41.55	TFEE	41.79
Compliance Check	See BREL	% DFEE < TFEE			0.59
% DPER < TPER	4.24	DPER	59.88	TPER	62.53
Assessor Details	Mr. Paul Goddard			Assessor ID	B342-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	47.4800 (1b)	x 2.5000 (2b)	= 118.7000 (1b) - (3b)
First floor	47.4800 (1c)	x 2.6000 (2c)	= 123.4480 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 242.1480 (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) = 0.1239 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3239 (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) = 0.2753 (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	0.3510	0.3441	0.3373	0.3028	0.2960	0.2615	0.2615	0.2547	0.2753	0.2960	0.3097	0.3235 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5616	0.5592	0.5569	0.5459	0.5438	0.5342	0.5342	0.5324	0.5379	0.5438	0.5480	0.5523 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			2.1600	1.0000	2.1600		(26)
Window			13.2400	1.1450	15.1603		(27)
Patio Door			3.3300	1.3258	4.4148		(27)
GF			47.4800	0.1200	5.6976	9.0000	427.3200 (28a)
Main	143.9220	18.7300	125.1920	0.1800	22.5346	18.0000	2253.4559 (29a)
PIJ	47.4800		47.4800	0.0900	4.2732	9.0000	427.3200 (30)
Total net area of external elements Aum(A, m ²)			238.8820				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 54.2404		(33)
Main dwelling							
Internal Wall 1			120.4500			75.0000	9033.7498 (32c)
Internal Floor 1			47.4100			18.0000	853.3800 (32d)
Internal Ceiling 1			47.4800			9.0000	427.3200 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 13422.5457 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							141.3495 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	

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E2 Other lintels (including other steel lintels)						13.9700		0.0500		0.6985			
E3 Sill						13.9700		0.0500		0.6985			
E4 Jamb						35.3200		0.0500		1.7660			
E5 Ground floor (normal)						28.2200		0.1000		2.8220			
E6 Intermediate floor within a dwelling						28.2200		0.0700		1.9754			
E16 Corner (normal)						20.3800		0.0900		1.8342			
E10 Eaves (insulation at ceiling level)						17.1400		0.0600		1.0284			
E12 Gable (insulation at ceiling level)						11.0800		0.0600		0.6648			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											11.4878	(36)	
Point Thermal bridges											0.0000		
Total fabric heat loss										(33) + (36) + (36a) =	65.7282	(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	44.8773	44.6862	44.4988	43.6187	43.4540	42.6875	42.6875	42.5455	42.9827	43.4540	43.7871	44.1354	(38)
Average = Sum(39)m / 12 =	110.6056	110.4144	110.2270	109.3469	109.1823	108.4157	108.4157	108.2738	108.7110	109.1823	109.5154	109.8636	(39)
												109.3461	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1648	1.1627	1.1608	1.1515	1.1498	1.1417	1.1417	1.1402	1.1448	1.1498	1.1533	1.1569	(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												2.6877	(42)
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	29.9176	29.4733	28.8476	27.6939	26.8300	25.8722	25.3548	25.9761	26.6526	27.6776	28.8550	29.8164	(42b)
Hot water usage for other uses													
	42.1549	40.6220	39.0891	37.5562	36.0233	34.4904	34.4904	36.0233	37.5562	39.0891	40.6220	42.1549	(42c)
Average daily hot water use (litres/day)												66.0609	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	72.0725	70.0952	67.9366	65.2501	62.8533	60.3625	59.8451	61.9994	64.2088	66.7666	69.4770	71.9713	(44)
Energy content (annual)	114.1452	99.8147	104.4161	89.3241	84.6127	74.2228	72.3775	76.7682	79.1758	90.6017	98.9827	112.6897	(45)
Distribution loss (46)m = 0.15 x (45)m												1097.1311	
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	97.0234	84.8425	88.7537	75.9255	71.9208	63.0894	61.5209	65.2529	67.2995	77.0114	84.1353	95.7863	(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													
	97.0234	84.8425	88.7537	75.9255	71.9208	63.0894	61.5209	65.2529	67.2995	77.0114	84.1353	95.7863	(64)
												932.5614	(64)
12Total per year (kWh/year)												933	(64)
Electric shower(s)													
	55.4849	49.4375	53.9838	51.5161	52.4828	50.0635	51.7323	52.4828	51.5161	53.9838	52.9687	55.4849	(64a)
												631.1372	(64a)
Heat gains from water heating, kWh/month													
	38.1271	33.5700	35.6844	31.8604	31.1009	28.2882	28.3133	29.4339	29.7039	32.7488	34.2760	37.8178	(65)

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

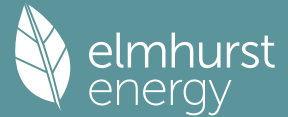
Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	128.3738	142.1281	128.3738	132.6529	128.3738	132.6529	128.3738	128.3738	132.6529	128.3738	132.6529	128.3738	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	247.9131	250.4856	244.0029	230.2018	212.7805	196.4068	185.4683	182.8957	189.3785	203.1795	220.6009	236.9745	(68)
Pumps, fans	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	(69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Water heating gains (Table 5)	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	(71)
Total internal gains	51.2461	49.9553	47.9629	44.2506	41.8023	39.2892	38.0555	39.5617	41.2554	44.0172	47.6056	50.8304	(72)
	490.8487	505.8849	483.6553	470.4210	446.2723	431.6647	415.2133	414.1470	426.6025	438.8863	464.1751	479.4944	(73)

6. Solar gains													

[Jan]													
			Area		Solar flux		g		FF		Access	Gains	
			m2		Table 6a		Specific data		Specific data		factor	W	
					W/m2		or Table 6b		or Table 6c		Table 6d		
Northeast			3.2500		11.2829		0.3300		0.0000		0.7700	9.3177	(75)
Southwest			4.7000		36.7938		0.3300		0.0000		0.7700	43.9418	(79)
Northwest			5.2900		11.2829		0.3300		0.0000		0.7700	15.1664	(81)
Northeast			3.3300		11.2829		0.6300		0.7000		0.7700	11.4826	(75)

Solar gains	79.9085	148.0603	234.3152	343.5164	433.3151	451.5362	426.4423	356.1837	271.6166	172.1941	97.8875	66.9772	(83)
Total gains	570.7571	653.9452	717.9704	813.9374	879.5873	883.2009	841.6555	770.3306	698.2192	611.0804	562.0626	546.4716	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	33.7097	33.7681	33.8255	34.0978	34.1492	34.3906	34.3906	34.4357	34.2972	34.1492	34.0453	33.9374
alpha	3.2473	3.2512	3.2550	3.2732	3.2766	3.2927	3.2927	3.2957	3.2865	3.2766	3.2697	3.2625
util living area	0.9846	0.9752	0.9579	0.9103	0.8179	0.6676	0.5253	0.5824	0.7934	0.9347	0.9754	0.9867 (86)
MIT	18.7990	19.0465	19.4388	19.9993	20.4910	20.8204	20.9398	20.9148	20.6622	20.0295	19.3265	18.7575 (87)
Th 2	19.9483	19.9499	19.9515	19.9590	19.9604	19.9669	19.9669	19.9681	19.9644	19.9604	19.9576	19.9546 (88)
util rest of house	0.9816	0.9702	0.9490	0.8903	0.7757	0.5905	0.4176	0.4744	0.7307	0.9161	0.9696	0.9840 (89)
MIT 2	17.9435	18.1895	18.5775	19.1260	19.5827	19.8630	19.9435	19.9321	19.7451	19.1656	18.4746	17.9067 (90)
Living area fraction									fLA = Living area /	(4) =		0.1874 (91)
MIT	18.1039	18.3502	18.7389	19.2897	19.7529	20.0425	20.1303	20.1163	19.9170	19.3275	18.6342	18.0662 (92)
Temperature adjustment												0.0000
adjusted MIT	18.1039	18.3502	18.7389	19.2897	19.7529	20.0425	20.1303	20.1163	19.9170	19.3275	18.6342	18.0662 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9740	0.9599	0.9356	0.8747	0.7660	0.5967	0.4356	0.4911	0.7274	0.9016	0.9594	0.9771 (94)
Useful gains	555.8916	627.7126	671.7051	711.9130	673.7798	526.9898	366.6069	378.2942	507.8935	550.9634	539.2523	533.9534 (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	1526.7838	1485.0927	1349.0626	1136.0786	879.2384	590.0488	382.7365	402.3799	632.3761	952.8911	1263.1772	1523.3872 (97)
Space heating kWh	722.3438	576.1594	503.9540	305.3992	152.8612	0.0000	0.0000	0.0000	0.0000	299.0342	521.2259	736.1388 (98a)
Space heating requirement - total per year (kWh/year)												3817.1166
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	722.3438	576.1594	503.9540	305.3992	152.8612	0.0000	0.0000	0.0000	0.0000	299.0342	521.2259	736.1388 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3817.1166
Space heating per m2										(98c) / (4) =		40.1971 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W												
	0.0000	0.0000	0.0000	0.0000	0.0000	1019.1077	802.2762	822.8806	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7514	0.8213	0.7805	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	765.7782	658.8971	642.2229	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	979.0038	933.0179	852.2032	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	153.5225	203.9459	156.2253	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	38.3806	50.9865	39.0563	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												128.4234 (107)
Energy for space heating												40.1971 (99)
Energy for space cooling												1.3524 (108)
Total												41.5495 (109)
Fabric Energy Efficiency (DFEE)												41.5 (109)

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

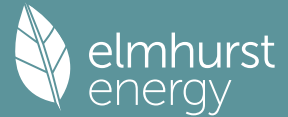
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	47.4800 (1b)	x 2.5000 (2b)	= 118.7000 (1b) - (3b)
First floor	47.4800 (1c)	x 2.6000 (2c)	= 123.4480 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	242.1480 (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)

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Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 30.0000 / (5) = 0.1239 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 5.0000 (17)
Infiltration rate 0.3739 (18)
Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3178 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4052	0.3973	0.3893	0.3496	0.3416	0.3019	0.3019	0.2940	0.3178	0.3416	0.3575	0.3734 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5821	0.5789	0.5758	0.5611	0.5584	0.5456	0.5456	0.5432	0.5505	0.5584	0.5639	0.5697 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.1600	1.0000	2.1600		(26)
TER Opening Type			16.5700	1.1450	18.9733		(27)
GF			47.4800	0.1300	6.1724		(28a)
Main	143.9220	18.7300	125.1920	0.1800	22.5346		(29a)
PIJ	47.4800		47.4800	0.1100	5.2228		(30)
Total net area of external elements Aum(A, m2)			238.8820				(31)
Fabric heat loss, W/K = Sum (A x U)					55.0630		(33)
					(26)...(30) + (32) =		

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 141.3495 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	13.9700	0.0500	0.6985
E3 Sill	13.9700	0.0500	0.6985
E4 Jamb	35.3200	0.0500	1.7660
E5 Ground floor (normal)	28.2200	0.1600	4.5152
E6 Intermediate floor within a dwelling	28.2200	0.0000	0.0000
E16 Corner (normal)	20.3800	0.0900	1.8342
E10 Eaves (insulation at ceiling level)	17.1400	0.0600	1.0284
E12 Gable (insulation at ceiling level)	11.0800	0.0600	0.6648

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.2056 (36)

Point Thermal bridges

Total fabric heat loss (33) + (36) + (36a) = 66.2686 (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	46.5146	46.2598	46.0101	44.8373	44.6179	43.5964	43.5964	43.4073	43.9899	44.6179	45.0618	45.5259 (38)
Heat transfer coeff	112.7832	112.5285	112.2788	111.1060	110.8865	109.8651	109.8651	109.6759	110.2585	110.8865	111.3304	111.7945 (39)
Average = Sum(39)m / 12 =												111.1049

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1877	1.1850	1.1824	1.1700	1.1677	1.1570	1.1570	1.1550	1.1611	1.1677	1.1724	1.1773 (40)
HLP (average)												1.1700
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6877 (42)

Hot water usage for mixer showers 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (42a)

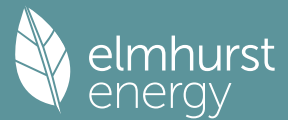
Hot water usage for baths 29.9176 29.4733 28.8476 27.6939 26.8300 25.8722 25.3548 25.9761 26.6526 27.6776 28.8550 29.8164 (42b)

Hot water usage for other uses 42.1549 40.6220 39.0891 37.5562 36.0233 34.4904 34.4904 36.0233 37.5562 39.0891 40.6220 42.1549 (42c)

Average daily hot water use (litres/day) 66.0609 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	72.0725	70.0952	67.9366	65.2501	62.8533	60.3625	59.8451	61.9994	64.2088	66.7666	69.4770	71.9713 (44)
Energy conte	114.1452	99.8147	104.4161	89.3241	84.6127	74.2228	72.3775	76.7682	79.1758	90.6017	98.9827	112.6897 (45)
Energy content (annual)										Total = Sum(45)m =		1097.1311
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	97.0234	84.8425	88.7537	75.9255	71.9208	63.0894	61.5209	65.2529	67.2995	77.0114	84.1353	95.7863 (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	97.0234	84.8425	88.7537	75.9255	71.9208	63.0894	61.5209	65.2529	67.2995	77.0114	84.1353	95.7863 (64)
								Total per year (kWh/year) = Sum(64)m =				932.5614 (64)
												933 (64)
12Total per year (kWh/year)												
Electric shower(s)	55.4849	49.4375	53.9838	51.5161	52.4828	50.0635	51.7323	52.4828	51.5161	53.9838	52.9687	55.4849 (64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				631.1372 (64a)
Heat gains from water heating, kWh/month	38.1271	33.5700	35.6844	31.8604	31.1009	28.2882	28.3133	29.4339	29.7039	32.7488	34.2760	37.8178 (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	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	128.3738	142.1281	128.3738	132.6529	128.3738	132.6529	128.3738	128.3738	132.6529	128.3738	132.6529	128.3738 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	247.9131	250.4856	244.0029	230.2018	212.7805	196.4068	185.4683	182.8957	189.3785	203.1795	220.6009	236.9745 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386 (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)	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086 (71)
Water heating gains (Table 5)	51.2461	49.9553	47.9629	44.2506	41.8023	39.2892	38.0555	39.5617	41.2554	44.0172	47.6056	50.8304 (72)
Total internal gains	490.8487	505.8849	483.6553	470.4210	446.2723	431.6647	415.2133	414.1470	426.6025	438.8863	464.1751	479.4944 (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			6.5800	11.2829		0.6300	0.7000		0.7700		22.6892 (75)	
Southwest			4.7000	36.7938		0.6300	0.7000		0.7700		52.8500 (79)	
Northwest			5.2900	11.2829		0.6300	0.7000		0.7700		18.2410 (81)	
Solar gains	93.7803	173.3378	273.2802	399.1363	502.3139	522.9831	494.0983	413.4079	316.2782	201.3119	114.8030	78.6543 (83)
Total gains	584.6289	679.2227	756.9355	869.5573	948.5861	954.6478	909.3116	827.5549	742.8808	640.1982	578.9781	558.1487 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	33.0589	33.1337	33.2074	33.5579	33.6243	33.9369	33.9369	33.9955	33.8158	33.6243	33.4903	33.3512
alpha	3.2039	3.2089	3.2138	3.2372	3.2416	3.2625	3.2625	3.2664	3.2544	3.2416	3.2327	3.2234
util living area	0.9836	0.9727	0.9525	0.8977	0.7951	0.6383	0.4976	0.5559	0.7740	0.9281	0.9735	0.9858 (86)
MIT	18.7732	19.0396	19.4540	20.0358	20.5260	20.8390	20.9469	20.9236	20.6814	20.0432	19.3185	18.7336 (87)
Th 2	19.9299	19.9320	19.9341	19.9441	19.9459	19.9546	19.9546	19.9562	19.9512	19.9459	19.9421	19.9382 (88)
util rest of house	0.9803	0.9673	0.9425	0.8755	0.7500	0.5604	0.3924	0.4491	0.7085	0.9078	0.9673	0.9830 (89)
MIT 2	17.9052	18.1700	18.5792	19.1475	19.5987	19.8631	19.9344	19.9246	19.7475	19.1670	18.4558	17.8717 (90)
Living area fraction	18.0679	18.3330	18.7432	19.3140	19.7725	20.0460	20.1242	20.1118	19.9225	19.3313	18.6175	18.0332 (91)
MIT	18.0679	18.3330	18.7432	19.3140	19.7725	20.0460	20.1242	20.1118	19.9225	19.3313	18.6175	18.0332 (92)
Temperature adjustment												0.0000
adjusted MIT	18.0679	18.3330	18.7432	19.3140	19.7725	20.0460	20.1242	20.1118	19.9225	19.3313	18.6175	18.0332 (93)

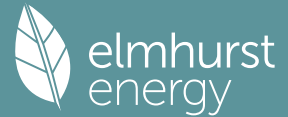
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9723	0.9562	0.9281	0.8596	0.7416	0.5678	0.4103	0.4660	0.7064	0.8928	0.9565	0.9757 (94)
Useful gains	568.4213	649.4866	702.5491	747.4612	703.4881	542.0037	373.0979	385.6775	524.7760	571.5914	553.8126	544.6108 (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	1552.7874	1511.5995	1374.6525	1157.0606	895.1305	598.3301	387.1857	407.0990	641.9855	968.1816	1282.2467	1546.4792 (97)
Space heating kWh	732.3684	579.3399	500.0449	294.9116	142.5820	0.0000	0.0000	0.0000	0.0000	295.0631	524.4725	745.3901 (98a)
Space heating requirement - total per year (kWh/year)												3814.1724
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	732.3684	579.3399	500.0449	294.9116	142.5820	0.0000	0.0000	0.0000	0.0000	295.0631	524.4725	745.3901 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3814.1724
Space heating per m ²												40.1661 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W												
	0.0000	0.0000	0.0000	0.0000	0.0000	1032.7316	813.0015	833.5368	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7762	0.8414	0.8015	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	801.5597	684.0409	668.1124	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1062.5132	1012.0964	919.0886	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	187.8866	244.0733	186.7263	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	46.9716	61.0183	46.6816	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												154.6715 (107)
Energy for space heating												40.1661 (99)
Energy for space cooling												1.6288 (108)
Total												41.7949 (109)
Fabric Energy Efficiency (TFEE)												41.8 (109)

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Property Reference	HT11-Det			Issued on Date	07/05/2025
Assessment Reference	001	Prop Type Ref			
Property	Highmoor Lane, CLECKHEATON, BD19 6LW				
SAP Rating	94 A	DER	11.37	TER	11.95
Environmental	90 B	% DER < TER			4.85
CO ₂ Emissions (t/year)	1.07	DFEE	41.55	TFEE	41.79
Compliance Check	See BREL	% DFEE < TFEE			0.59
% DPER < TPER	4.24	DPER	59.88	TPER	62.53
Assessor Details	Mr. Paul Goddard			Assessor ID	B342-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	47.4800 (1b)	x 2.5000 (2b)	= 118.7000 (1b) - (3b)
First floor	47.4800 (1c)	x 2.6000 (2c)	= 123.4480 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 242.1480 (5)

2. Ventilation rate

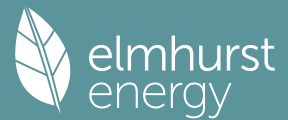
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.2000 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1700 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			2.1600	1.0000	2.1600		(26)
Window			13.2400	1.1450	15.1603		(27)
Patio Door			3.3300	1.3258	4.4148		(27)
GF			47.4800	0.1200	5.6976	9.0000	427.3200 (28a)
Main	143.9220	18.7300	125.1920	0.1800	22.5346	18.0000	2253.4559 (29a)
PIJ	47.4800		47.4800	0.0900	4.2732	9.0000	427.3200 (30)
Total net area of external elements Aum(A, m ²)			238.8820				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	54.2404		(33)
Main dwelling							
Internal Wall 1			120.4500			75.0000	9033.7498 (32c)
Internal Floor 1			47.4100			18.0000	853.3800 (32d)
Internal Ceiling 1			47.4800			9.0000	427.3200 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13422.5457 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							141.3495 (35)

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List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	13.9700	0.0500	0.6985
E3 Sill	13.9700	0.0500	0.6985
E4 Jamb	35.3200	0.0500	1.7660
E5 Ground floor (normal)	28.2200	0.1000	2.8220
E6 Intermediate floor within a dwelling	28.2200	0.0700	1.9754
E16 Corner (normal)	20.3800	0.0900	1.8342
E10 Eaves (insulation at ceiling level)	17.1400	0.0600	1.0284
E12 Gable (insulation at ceiling level)	11.0800	0.0600	0.6648
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.4878 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	65.7282 (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	
	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544	(38)
Heat transfer coeff	105.6827	105.6827	105.6827	105.6827	105.6827	105.6827	105.6827	105.6827	105.6827	105.6827	105.6827	105.6827	(39)
Average = Sum(39)m / 12 =												105.6827	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1129	1.1129	1.1129	1.1129	1.1129	1.1129	1.1129	1.1129	1.1129	1.1129	1.1129	1.1129	(40)
HLP (average)												1.1129	(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													2.6877 (42)
Hot water usage for mixer showers													
69.2839	68.2427	66.7255	63.8225	61.6802	59.2911	57.9332	59.4389	61.0895	63.6547	66.6200	69.0185	69.0185	(42a)
Hot water usage for baths													
29.9176	29.4733	28.8476	27.6939	26.8300	25.8722	25.3548	25.9761	26.6526	27.6776	28.8550	29.8164	29.8164	(42b)
Hot water usage for other uses													
42.1549	40.6220	39.0891	37.5562	36.0233	34.4904	34.4904	36.0233	37.5562	39.0891	40.6220	42.1549	42.1549	(42c)
Average daily hot water use (litres/day)												129.9384	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	141.3564	138.3380	134.6621	129.0726	124.5335	119.6537	117.7783	121.4383	125.2983	130.4213	136.0969	140.9898	(44)
Energy conte	223.8740	196.9914	206.9707	176.6939	167.6461	147.1282	142.4427	150.3660	154.5053	176.9805	193.8950	220.7559	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
33.5811	29.5487	31.0456	26.5041	25.1469	22.0692	21.3664	22.5549	23.1758	26.5471	29.0843	33.1134	33.1134	(46)
Water storage loss:													
Total storage loss													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	1.5610	1.4390	1.5956	1.4708	1.4792	1.3771	1.3627	1.3779	1.3503	1.4469	1.4642	1.5482	(61)
Total heat required for water heating calculated for each month													
225.4350	198.4304	208.5663	178.1647	169.1253	148.5053	143.8053	151.7439	155.8556	178.4274	195.3592	222.3041	222.3041	(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	225.4350	198.4304	208.5663	178.1647	169.1253	148.5053	143.8053	151.7439	155.8556	178.4274	195.3592	222.3041	(64)
12Total per year (kWh/year)													
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												2175.7225	(64)
Heat gains from water heating, kWh/month													
74.8284	65.8594	69.2166	59.1184	56.1121	49.2644	47.7029	50.3412	51.7106	59.2077	64.8361	73.7884	73.7884	(65)

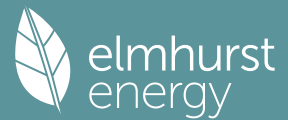
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
128.3738	142.1281	128.3738	132.6529	128.3738	132.6529	128.3738	128.3738	132.6529	128.3738	132.6529	128.3738	128.3738	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
247.9131	250.4856	244.0029	230.2018	212.7805	196.4068	185.4683	182.8957	189.3785	203.1795	220.6009	236.9745	236.9745	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	(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)													
-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	(71)
Water heating gains (Table 5)													
100.5757	98.0051	93.0331	82.1089	75.4195	68.4228	64.1167	67.6629	71.8203	79.5803	90.0502	99.1780	99.1780	(72)
Total internal gains	543.1783	556.9346	531.7255	511.2794	482.8895	460.7983	441.2745	442.2481	457.1674	477.4493	509.6197	530.8420	(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			3.2500		11.2829		0.3300		0.0000		0.7700		9.3177 (75)
Southwest			4.7000		36.7938		0.3300		0.0000		0.7700		43.9418 (79)
Northwest			5.2900		11.2829		0.3300		0.0000		0.7700		15.1664 (81)
Northeast			3.3300		11.2829		0.6300		0.7000		0.7700		11.4826 (75)
Solar gains	79.9085	148.0603	234.3152	343.5164	433.3151	451.5362	426.4423	356.1837	271.6166	172.1941	97.8875		66.9772 (83)
Total gains	623.0868	704.9949	766.0407	854.7958	916.2046	912.3345	867.7168	798.4318	728.7840	649.6435	607.5073		597.8192 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	35.2800	35.2800	35.2800	35.2800	35.2800	35.2800	35.2800	35.2800	35.2800	35.2800	35.2800	35.2800	
alpha	3.3520	3.3520	3.3520	3.3520	3.3520	3.3520	3.3520	3.3520	3.3520	3.3520	3.3520	3.3520	
util living area	0.9801	0.9688	0.9485	0.8961	0.7965	0.6448	0.5030	0.5578	0.7704	0.9219	0.9689	0.9826 (86)	
MIT	18.9944	19.2303	19.5999	20.1089	20.5602	20.8469	20.9504	20.9292	20.7086	20.1309	19.4703	18.9356 (87)	
Th 2	19.9903	19.9903	19.9903	19.9903	19.9903	19.9903	19.9903	19.9903	19.9903	19.9903	19.9903	19.9903 (88)	
util rest of house	0.9762	0.9628	0.9382	0.8742	0.7527	0.5689	0.4001	0.4538	0.7062	0.9009	0.9619	0.9792 (89)	
MIT 2	17.6493	17.9479	18.4139	19.0431	19.5745	19.8774	19.9656	19.9521	19.7499	19.0825	18.2558	17.5748 (90)	
Living area fraction									fLA = Living area / (4) =				0.1874 (91)
MIT	17.9014	18.1883	18.6362	19.2429	19.7592	20.0591	20.1502	20.1353	19.9296	19.2790	18.4835	17.8299 (92)	
Temperature adjustment												-0.1500	
adjusted MIT	17.7514	18.0383	18.4862	19.0929	19.6092	19.9091	20.0002	19.9853	19.7796	19.1290	18.3335	17.6799 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9636	0.9464	0.9175	0.8501	0.7337	0.5622	0.4012	0.4532	0.6907	0.8773	0.9454	0.9677	(94)
Useful gains	600.4174	667.2331	702.8645	726.6736	672.2161	512.9320	348.1359	361.8704	503.3555	569.9544	574.3112	578.4907	(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	1421.5849	1388.4853	1266.7372	1077.2149	835.8688	561.0797	359.3404	378.9019	600.2358	901.3672	1187.1815	1424.5872	(97)
Space heating kWh	610.9486	484.6815	419.5213	252.3897	121.7576	0.0000	0.0000	0.0000	0.0000	246.5711	441.2666	629.4957	(98a)
Space heating requirement - total per year (kWh/year)												3206.6321	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	610.9486	484.6815	419.5213	252.3897	121.7576	0.0000	0.0000	0.0000	0.0000	246.5711	441.2666	629.4957	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3206.6321	
Space heating per m2											(98c) / (4) =	33.7682	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													88.7000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	610.9486	484.6815	419.5213	252.3897	121.7576	0.0000	0.0000	0.0000	0.0000	246.5711	441.2666	629.4957	(98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000	(210)
Space heating fuel (main heating system)	688.7808	546.4278	472.9665	284.5431	137.2690	0.0000	0.0000	0.0000	0.0000	277.9832	497.4820	709.6908	(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	225.4350	198.4304	208.5663	178.1647	169.1253	148.5053	143.8053	151.7439	155.8556	178.4274	195.3592	222.3041	(64)
Efficiency of water heater (217)m	84.9442	84.6656	84.1179	83.0617	80.9767	76.2000	76.2000	76.2000	76.2000	82.9848	84.4489	76.2000	(216)
Fuel for water heating, kWh/month	265.3919	234.3696	247.9452	214.4969	208.8568	194.8888	188.7209	199.1390	204.5349	215.0120	231.3342	261.3545	(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	11.3307	10.2342	11.3307	10.9652	11.3307	10.9652	11.3307	11.3307	10.9652	11.3307	10.9652	11.3307	(231)
Lighting	30.1928	24.2218	21.8090	15.9782	12.3421	10.0836	11.2588	14.6347	19.0090	24.9408	28.1706	31.0320	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-42.4772	-59.8154	-85.8610	-96.3886	-103.8033	-96.8480	-95.6895	-90.4479	-81.1060	-68.3937	-46.6921	-36.7354	(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	-24.1437	-50.7972	-100.9797	-151.6787	-200.5618	-201.5106	-199.0999	-168.5282	-123.4886	-72.5961	-32.2211	-19.0877	(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													3615.1433 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													76.2000
Water heating fuel used													2666.0447 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 4.6540, total flow = 29.0000, SFP = 0.1605)													
mechanical ventilation fans (SFP = 0.1605)													47.4099 (230a)
central heating pump													41.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													133.4099 (231)

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Electricity for lighting (calculated in Appendix L)	243.6733 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2248.9515 (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	4409.3197 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3615.1433	0.2100	759.1801 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2666.0447	0.2100	559.8694 (264)
Space and water heating			1319.0495 (265)
Pumps, fans and electric keep-hot	133.4099	0.1432	18.8939 (267)
Energy for lighting	243.6733	0.1490	36.3121 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-904.2581	0.1390	-125.6606
PV Unit electricity exported	-1344.6934	0.1259	-169.2925
Total			-294.9531 (269)
Total CO2, kg/year			1079.3024 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.3700 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3615.1433	1.1300	4085.1119 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2666.0447	1.1300	3012.6305 (278)
Space and water heating			7097.7424 (279)
Pumps, fans and electric keep-hot	133.4099	1.5335	203.6088 (281)
Energy for lighting	243.6733	1.5547	378.8497 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-904.2581	1.5180	-1372.6812
PV Unit electricity exported	-1344.6934	0.4621	-621.4202
Total			-1994.1013 (283)
Total Primary energy kWh/year			5686.0996 (286)
Dwelling Primary energy Rate (DPER)			59.8800 (287)

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

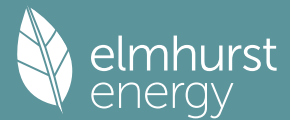
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	47.4800 (1b)	x 2.5000 (2b)	= 118.7000 (1b) - (3b)
First floor	47.4800 (1c)	x 2.6000 (2c)	= 123.4480 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	242.1480 (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) = 0.1239 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3739 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3178 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000 (22)
Wind factor	1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 0.9500 0.9250 1.0000 1.0750 1.1250 1.1750 (22a)
Adj infilt rate	

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Effective ac	0.4052	0.3973	0.3893	0.3496	0.3416	0.3019	0.3019	0.2940	0.3178	0.3416	0.3575	0.3734 (22b)
	0.5821	0.5789	0.5758	0.5611	0.5584	0.5456	0.5456	0.5432	0.5505	0.5584	0.5639	0.5697 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.1600	1.0000	2.1600		(26)
TER Opening Type			16.5700	1.1450	18.9733		(27)
GF			47.4800	0.1300	6.1724		(28a)
Main	143.9220	18.7300	125.1920	0.1800	22.5346		(29a)
PIJ	47.4800		47.4800	0.1100	5.2228		(30)
Total net area of external elements Aum (A, m2)			238.8820				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	55.0630		(33)

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

141.3495 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	13.9700	0.0500	0.6985
E3 Sill	13.9700	0.0500	0.6985
E4 Jamb	35.3200	0.0500	1.7660
E5 Ground floor (normal)	28.2200	0.1600	4.5152
E6 Intermediate floor within a dwelling	28.2200	0.0000	0.0000
E16 Corner (normal)	20.3800	0.0900	1.8342
E10 Eaves (insulation at ceiling level)	17.1400	0.0600	1.0284
E12 Gable (insulation at ceiling level)	11.0800	0.0600	0.6648
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.2056 (36)
Point Thermal Bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	66.2686 (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	46.5146	46.2598	46.0101	44.8373	44.6179	43.5964	43.5964	43.4073	43.9899	44.6179	45.0618	45.5259 (38)
Heat transfer coeff	112.7832	112.5285	112.2788	111.1060	110.8865	109.8651	109.8651	109.6759	110.2585	110.8865	111.3304	111.7945 (39)
Average = Sum(39)m / 12 =												111.1049

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1877	1.1850	1.1824	1.1700	1.1677	1.1570	1.1570	1.1550	1.1611	1.1677	1.1724	1.1773 (40)
HLP (average)												1.1700
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

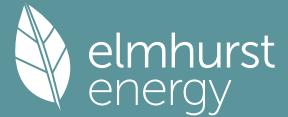
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6877 (42)
Hot water usage for mixer showers	69.2839	68.2427	66.7255	63.8225	61.6802	59.2911	57.9332	59.4389	61.0895	63.6547	66.6200	69.0185 (42a)
Hot water usage for baths	29.9176	29.4733	28.8476	27.6939	26.8300	25.8722	25.3548	25.9761	26.6526	27.6776	28.8550	29.8164 (42b)
Hot water usage for other uses	42.1549	40.6220	39.0891	37.5562	36.0233	34.4904	34.4904	36.0233	37.5562	39.0891	40.6220	42.1549 (42c)
Average daily hot water use (litres/day)												129.9384 (43)
Daily hot water use	141.3564	138.3380	134.6621	129.0726	124.5335	119.6537	117.7783	121.4383	125.2983	130.4213	136.0969	140.9898 (44)
Energy conte	223.8740	196.9914	206.9707	176.6939	167.6461	147.1282	142.4427	150.3660	154.5053	176.9805	193.8950	220.7559 (45)
Energy content (annual)										Total = Sum(45)m =		2158.2497
Distribution loss (46)m = 0.15 x (45)m	33.5811	29.5487	31.0456	26.5041	25.1469	22.0692	21.3664	22.5549	23.1758	26.5471	29.0843	33.1134 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	274.8329	243.0188	257.9296	226.0090	218.6050	196.4432	193.4016	201.3249	203.8204	227.9394	243.2101	271.7149 (62)
WWHRS	-31.6737	-28.0125	-29.3331	-24.2889	-22.6364	-19.3701	-18.1564	-19.3075	-20.0411	-23.6262	-26.7657	-31.0872 (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	243.1592	215.0063	228.5965	201.7201	195.9686	177.0731	175.2452	182.0173	183.7793	204.3131	216.4444	240.6277 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2463.9507 (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	87.1778	77.0065	81.5575	71.0795	68.4820	61.2489	60.1019	62.7364	63.7018	71.5857	76.7989	86.1411 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	128.3738	142.1281	128.3738	132.6529	128.3738	132.6529	128.3738	128.3738	132.6529	128.3738	132.6529	128.3738 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	247.9131	250.4856	244.0029	230.2018	212.7805	196.4068	185.4683	182.8957	189.3785	203.1795	220.6009	236.9745 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386 (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)	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086 (71)
Water heating gains (Table 5)	117.1745	114.5930	109.6203	98.7215	92.0458	85.0679	80.7821	84.3231	88.4747	96.2174	106.6651	115.7810 (72)
Total internal gains	559.7771	573.5225	548.3127	527.8920	499.5157	477.4434	457.9399	458.9084	473.8218	494.0864	526.2346	547.4450 (73)

Full SAP Calculation Printout



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	6.5800		11.2829		0.6300		0.7000		0.7700		22.6892 (75)	
Southwest	4.7000		36.7938		0.6300		0.7000		0.7700		52.8500 (79)	
Northwest	5.2900		11.2829		0.6300		0.7000		0.7700		18.2410 (81)	
Solar gains	93.7803	173.3378	273.2802	399.1363	502.3139	522.9831	494.0983	413.4079	316.2782	201.3119	114.8030	78.6543 (83)
Total gains	653.5574	746.8604	821.5929	927.0283	1001.8296	1000.4265	952.0382	872.3163	790.1001	695.3984	641.0376	626.0993 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	33.0589	33.1337	33.2074	33.5579	33.6243	33.9369	33.9369	33.9955	33.8158	33.6243	33.4903	33.3512
alpha	3.2039	3.2089	3.2138	3.2372	3.2416	3.2625	3.2625	3.2664	3.2544	3.2416	3.2327	3.2234
util living area	0.9778	0.9649	0.9417	0.8825	0.7752	0.6178	0.4788	0.5332	0.7503	0.9128	0.9652	0.9805 (86)
MIT	18.8820	19.1418	19.5439	20.0999	20.5642	20.8540	20.9526	20.9324	20.7120	20.1127	19.4127	18.8422 (87)
Th 2	19.9299	19.9320	19.9341	19.9441	19.9459	19.9546	19.9546	19.9562	19.9512	19.9459	19.9421	19.9382 (88)
util rest of house	0.9734	0.9581	0.9300	0.8581	0.7282	0.5402	0.3762	0.4287	0.6825	0.8894	0.9573	0.9767 (89)
MIT 2	17.4695	17.7991	18.3063	18.9969	19.5401	19.8492	19.9317	19.9208	19.7182	19.0283	18.1525	17.4240 (90)
Living area fraction	17.7343	18.0508	18.5383	19.2037	19.7321	20.0376	20.1231	20.1104	19.9045	19.2316	18.3887	17.6899 (92)
Temperature adjustment												0.0000
adjusted MIT	17.7343	18.0508	18.5383	19.2037	19.7321	20.0376	20.1231	20.1104	19.9045	19.2316	18.3887	17.6899 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9604	0.9415	0.9097	0.8374	0.7175	0.5468	0.3935	0.4451	0.6791	0.8692	0.9410	0.9648 (94)
Useful gains	627.6756	703.1799	747.4393	776.3237	718.8077	547.0474	374.6038	388.2277	536.5293	604.4168	603.2146	604.0314 (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	1515.1598	1479.8407	1351.6422	1144.8020	890.6480	597.3980	387.0608	406.9409	639.9971	957.1260	1256.7782	1508.0936 (97)
Space heating kWh	660.2883	521.9160	449.5269	265.3044	127.8492	0.0000	0.0000	0.0000	0.0000	262.4157	470.5658	672.6222 (98a)
Space heating requirement - total per year (kWh/year)												3430.4885
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	660.2883	521.9160	449.5269	265.3044	127.8492	0.0000	0.0000	0.0000	0.0000	262.4157	470.5658	672.6222 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3430.4885
Space heating per m2										(98c) / (4) =		36.1256 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (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	660.2883	521.9160	449.5269	265.3044	127.8492	0.0000	0.0000	0.0000	0.0000	262.4157	470.5658	672.6222 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	714.5977	564.8442	486.5010	287.1259	138.3650	0.0000	0.0000	0.0000	0.0000	283.9996	509.2703	727.9461 (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	243.1592	215.0063	228.5965	201.7201	195.9686	177.0731	175.2452	182.0173	183.7793	204.3131	216.4444	240.6277 (64)
Efficiency of water heater	86.4092	86.2063	85.8023	84.9694	83.4888	80.3000	80.3000	80.3000	80.3000	84.9188	85.9983	80.3000 (216)
Fuel for water heating, kWh/month	281.4041	249.4091	266.4224	237.4031	234.7245	220.5144	218.2381	226.6717	228.8659	240.5983	251.6846	278.3104 (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	26.6735	21.3985	19.2670	14.1158	10.9035	8.9082	9.9465	12.9288	16.7933	22.0337	24.8870	27.4149 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-43.6531	-61.1513	-87.3400	-97.5430	-104.6074	-97.4028	-96.1601	-91.0357	-81.9414	-69.5763	-47.8369	-37.7835 (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)	-25.8670	-54.2747	-107.6314	-161.3194	-213.0027	-213.9394	-211.4575	-179.2100	-131.5565	-77.5488	-34.5103	-20.4688 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												

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(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												3712.6499	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2934.2465	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												215.2708	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2346.8179	(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												4601.3492	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3712.6499	0.2100	779.6565	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2934.2465	0.2100	616.1918	(264)
Space and water heating			1395.8482	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	215.2708	0.1443	31.0702	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-916.0315	0.1347	-123.4189	
PV Unit electricity exported	-1430.7865	0.1260	-180.2126	
Total			-303.6315	(269)
Total CO2, kg/year			1135.2162	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.9500	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3712.6499	1.1300	4195.2944	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2934.2465	1.1300	3315.6986	(278)
Space and water heating			7510.9930	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	215.2708	1.5338	330.1895	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-916.0315	1.4980	-1372.1744	
PV Unit electricity exported	-1430.7865	0.4623	-661.5074	
Total			-2033.6818	(283)
Total Primary energy kWh/year			5937.6014	(286)
Target Primary Energy Rate (TPER)			62.5300	(287)

Predicted Energy Assessment



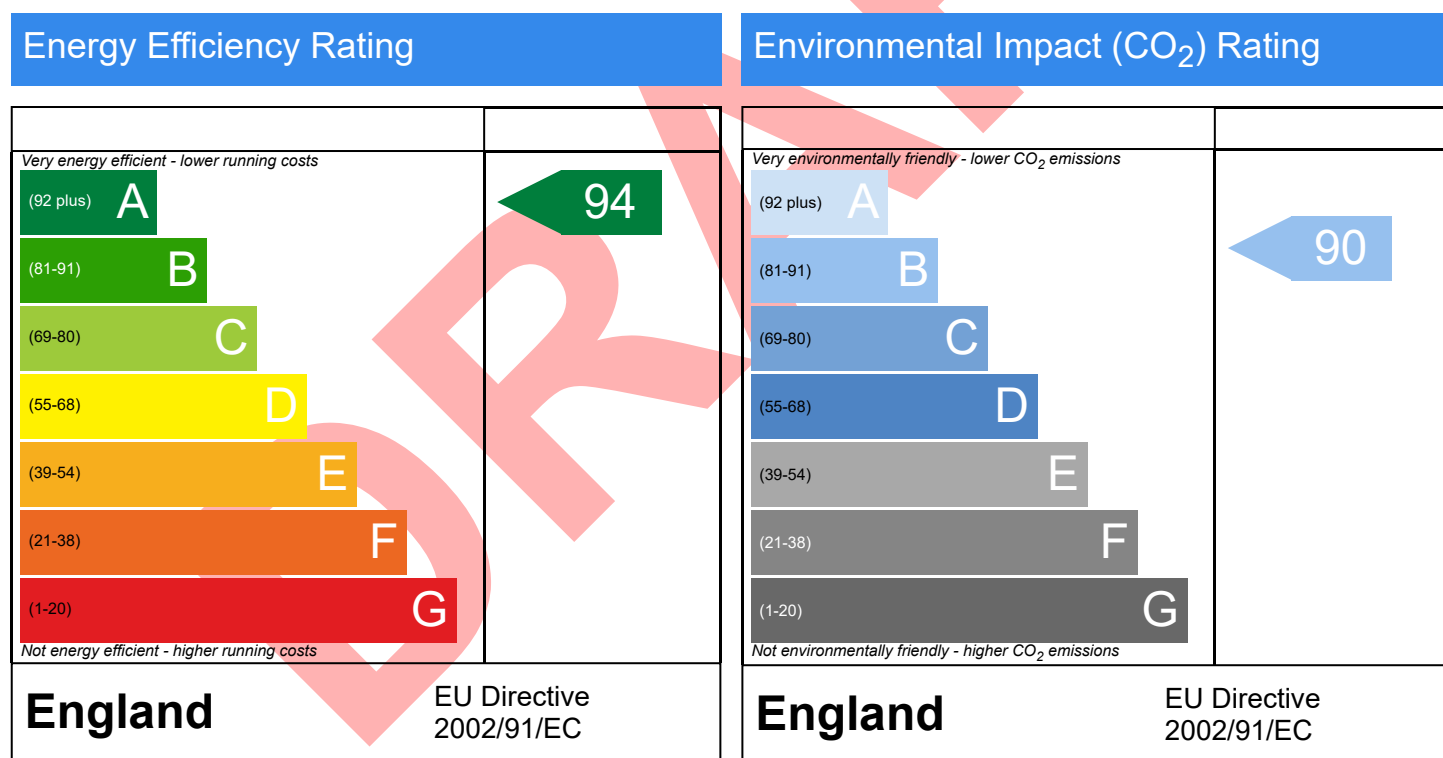
Highmoor Lane, CLECKHEATON, BD19 6LW

Dwelling type:
Date of assessment:
Produced by:
Total floor area:
DRRN:

House, Detached
07/05/2025
Paul Goddard
94.96 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

Energy Report



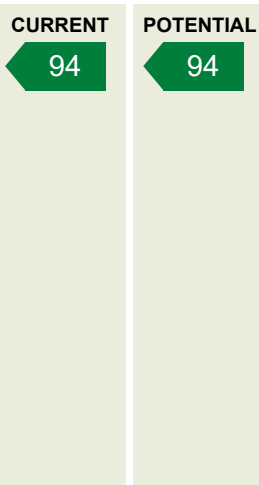
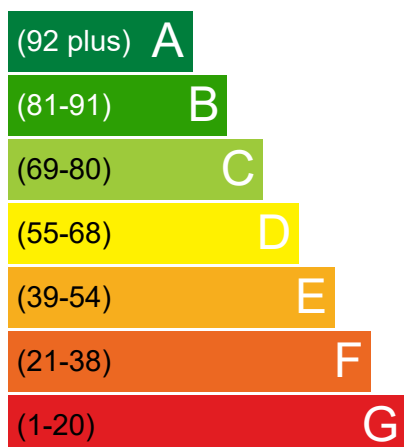
Dwelling Address	Highmoor Lane, CLECKHEATON, BD19 6LW
Reference	HT11-Det-001
Assessment Date	07/05/2025
Submission Date	
Property Type	House, Detached
Total Floor Area	95

This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

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

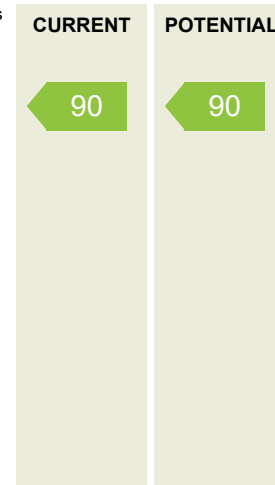
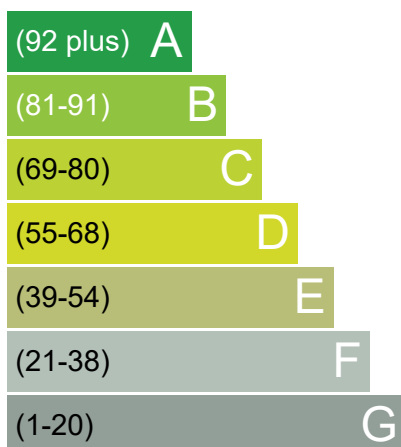
Energy Efficiency Rating

Most energy efficient - lower running costs

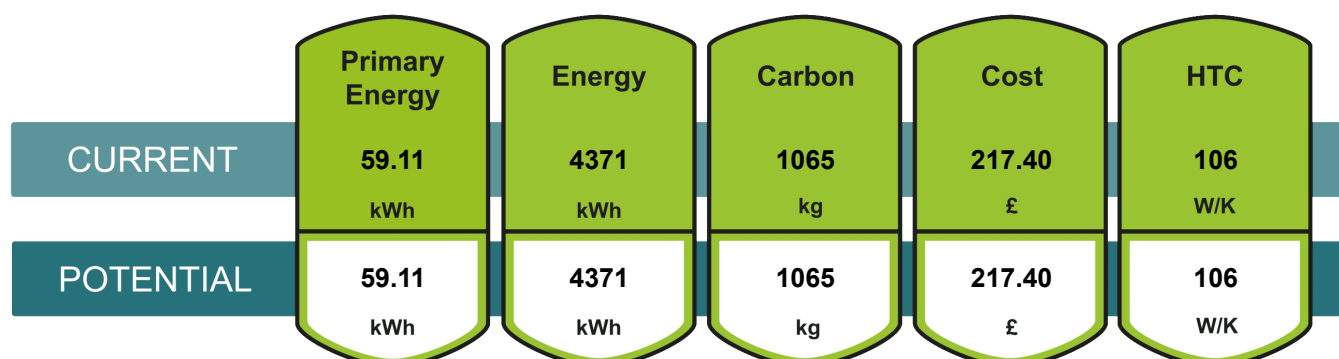


Carbon Dioxide (CO2) Emissions Rating

Very environmentally friendly - lower CO2 emissions



Additional ratings for your home



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 0.18 W/m ² K	Very Good
Roof	Average thermal transmittance 0.09 W/m ² K	Very Good
Floor	Average thermal transmittance 0.12 W/m ² K	Very Good
Windows	High performance glazing	Good
Main heating	Boiler and radiators, mains gas	Very Good
Main heating controls	Time and temperature zone control	Very Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 4.0 m ³ /h.m ² (assumed)	Good

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 measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating
Solar water heating	£19	A 95			B 91

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

		Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting		£72	£72	
Heating		£333	£333	
Hot Water		£149	£149	
New Technologies e.g. Impact of PV		-(£337)	-(£337)	
TOTAL		£217	£217	

Estimated energy use and potential savings



Space Heating

3504

kWh per year



Water Heating

2668

kWh per year

About this document

Created by:
Company/Trading name:
Phone number:
Email address:

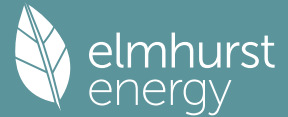
Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g. heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO ₂)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Full SAP Calculation Printout



Property Reference	HT11-Semi				Issued on Date	07/05/2025
Assessment Reference	001	Prop Type Ref				
Property	Highmoor Lane, CLECKHEATON, BD19 6LW					
SAP Rating	94 A	DER	10.46	TER	10.64	
Environmental	91 B	% DER < TER				1.69
CO ₂ Emissions (t/year)	0.98	DFEE	35.02	TFEE	35.59	
Compliance Check	See BREL	% DFEE < TFEE				1.61
% DPER < TPER	0.47	DPER	55.21	TPER	55.47	
Assessor Details	Mr. Paul Goddard				Assessor ID	B342-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	47.4800 (1b)	x 2.5000 (2b)	= 118.7000 (1b) - (3b)
First floor	47.4800 (1c)	x 2.6000 (2c)	= 123.4480 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 242.1480 (5)

2. Ventilation rate

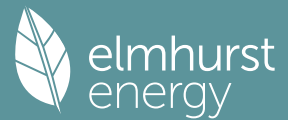
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.2000 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1700 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			2.1600	1.0000	2.1600		(26)
Window			13.2400	1.1450	15.1603		(27)
Patio Door			3.3300	1.3258	4.4148		(27)
GF			47.4800	0.1100	5.2228	9.0000	427.3200 (28a)
Main	100.2150	18.7300	81.4850	0.1800	14.6673	18.0000	1466.7299 (29a)
PIJ	47.4800		47.4800	0.0900	4.2732	9.0000	427.3200 (30)
Total net area of external elements Aum(A, m ²)			195.1750				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.8984		(33)
Main dwelling							
Party Wall 1			43.6600	0.0000	0.0000	20.0000	873.2000 (32)
Internal Wall 1			120.4500			75.0000	9033.7498 (32c)
Internal Floor 1			47.4100			18.0000	853.3800 (32d)
Internal Ceiling 1			47.4800			9.0000	427.3200 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13509.0197 (34)

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Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												142.2601 (35)
List of Thermal Bridges												
K1 Element												
E2 Other lintels (including other steel lintels)												
E3 Sill												
E4 Jamb												
E5 Ground floor (normal)												
E6 Intermediate floor within a dwelling												
E16 Corner (normal)												
E18 Party wall between dwellings												
P1 Party wall - Ground floor												
P4 Party wall - Roof (insulation at ceiling level)												
E10 Eaves (insulation at ceiling level)												
E12 Gable (insulation at ceiling level)												
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												10.9250 (36)
Point Thermal bridges												0.0000
Total fabric heat loss												(33) + (36) + (36a) = 56.8234 (37)

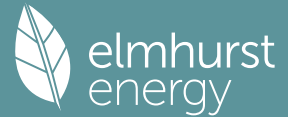
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544 (38)
Average = Sum(39)m / 12 =	96.7778	96.7778	96.7778	96.7778	96.7778	96.7778	96.7778	96.7778	96.7778	96.7778	96.7778	96.7778 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0191	1.0191	1.0191	1.0191	1.0191	1.0191	1.0191	1.0191	1.0191	1.0191	1.0191	1.0191 (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												2.6877 (42)
Hot water usage for mixer showers												
Hot water usage for baths												
Hot water usage for other uses												
Average daily hot water use (litres/day)												129.9384 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	141.3564	138.3380	134.6621	129.0726	124.5335	119.6537	117.7783	121.4383	125.2983	130.4213	136.0969	140.9898 (44)
Energy content (annual)	223.8740	196.9914	206.9707	176.6939	167.6461	147.1282	142.4427	150.3660	154.5053	176.9805	193.8950	220.7559 (45)
Distribution loss (46)m = 0.15 x (45)m												2158.2497
Water storage loss:												
Total storage loss												
If cylinder contains dedicated solar storage												
Primary loss												
Combi loss												
Total heat required for water heating calculated for each month												
WWHRS												
FV diverter												
Solar input												
FGHRS												
Output from w/h												
12Total per year (kWh/year)												
Electric shower(s)												
Heat gains from water heating, kWh/month												

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	128.3738	142.1281	128.3738	132.6529	128.3738	132.6529	128.3738	128.3738	132.6529	128.3738	132.6529	128.3738 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	247.9131	250.4856	244.0029	230.2018	212.7805	196.4068	185.4683	182.8957	189.3785	203.1795	220.6009	236.9745 (68)
Pumps, fans	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386 (69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086 (71)
Total internal gains	100.5757	98.0051	93.0331	82.1089	75.4195	68.4228	64.1167	67.6629	71.8203	79.5803	90.0502	99.1780 (72)
	543.1783	556.9346	531.7255	511.2794	482.8895	460.7983	441.2745	442.2481	457.1674	477.4493	509.6197	530.8420 (73)

6. Solar gains						
[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	4.7000	10.6334	0.3300	0.0000	0.7700	12.6991 (74)
South	3.2500	46.7521	0.3300	0.0000	0.7700	38.6090 (78)
West	5.2900	19.6403	0.3300	0.0000	0.7700	26.4002 (80)
South	3.3300	46.7521	0.6300	0.7000	0.7700	47.5792 (78)

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Solar gains	125.2876	217.0672	306.0947	393.5004	453.0154	454.9382	436.4599	391.3931	336.3277	242.4171	150.7464	106.7714 (83)
Total gains	668.4659	774.0018	837.8203	904.7798	935.9049	915.7365	877.7344	833.6412	793.4950	719.8664	660.3661	637.6134 (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	38.7744	38.7744	38.7744	38.7744	38.7744	38.7744	38.7744	38.7744	38.7744	38.7744	38.7744	38.7744
alpha	3.5850	3.5850	3.5850	3.5850	3.5850	3.5850	3.5850	3.5850	3.5850	3.5850	3.5850	3.5850
util living area	0.9748	0.9573	0.9300	0.8700	0.7664	0.6117	0.4658	0.5062	0.7101	0.8909	0.9587	0.9785 (86)
MIT	19.2865	19.5484	19.8913	20.3181	20.6753	20.8948	20.9698	20.9588	20.8147	20.3513	19.7350	19.2201 (87)
Th 2	20.0674	20.0674	20.0674	20.0674	20.0674	20.0674	20.0674	20.0674	20.0674	20.0674	20.0674	20.0674 (88)
util rest of house	0.9702	0.9497	0.9171	0.8455	0.7222	0.5407	0.3747	0.4141	0.6451	0.8651	0.9499	0.9745 (89)
MIT 2	18.0674	18.3970	18.8260	19.3476	19.7622	19.9899	20.0522	20.0452	19.9179	19.3984	18.6367	17.9834 (90)
Living area fraction									fLA = Living area /			0.1874 (91)
MIT	18.2959	18.6128	19.0257	19.5295	19.9333	20.1595	20.2242	20.2165	20.0860	19.5770	18.8426	18.2152 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.1459	18.4628	18.8757	19.3795	19.7833	20.0095	20.0742	20.0665	19.9360	19.4270	18.6926	18.0652 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9568	0.9322	0.8964	0.8242	0.7071	0.5360	0.3754	0.4140	0.6350	0.8434	0.9325	0.9623 (94)
Useful gains	639.5858	721.5320	751.0425	745.6926	661.8178	490.7908	329.4899	345.1028	503.8584	607.1192	615.8102	613.5877 (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	1339.9772	1312.5765	1197.6897	1014.1864	782.2886	523.5199	336.2237	354.8320	564.7923	854.2616	1121.9046	1341.8459 (97)
Space heating kWh	521.0912	397.1819	332.3055	193.3155	89.6302	0.0000	0.0000	0.0000	0.0000	183.8740	364.3879	541.8241 (98a)
Space heating requirement - total per year (kWh/year)												2623.6104
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	521.0912	397.1819	332.3055	193.3155	89.6302	0.0000	0.0000	0.0000	0.0000	183.8740	364.3879	541.8241 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2623.6104
Space heating per m2										(98c) / (4) =		27.6286 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												88.7000 (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	521.0912	397.1819	332.3055	193.3155	89.6302	0.0000	0.0000	0.0000	0.0000	183.8740	364.3879	541.8241 (98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)
Space heating fuel (main heating system)	587.4760	447.7812	374.6398	217.9431	101.0488	0.0000	0.0000	0.0000	0.0000	207.2987	410.8094	610.8502 (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	225.4350	198.4304	208.5663	178.1647	169.1253	148.5053	143.8053	151.7439	155.8556	178.4274	195.3592	222.3041 (64)
Efficiency of water heater												76.2000 (216)
(217)m	84.5134	84.1036	83.4230	82.2305	80.1106	76.2000	76.2000	76.2000	76.2000	82.0698	83.8967	84.6597 (217)
Fuel for water heating, kWh/month	266.7445	235.9356	250.0106	216.6652	211.1148	194.8888	188.7209	199.1390	204.5349	217.4095	232.8569	262.5855 (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	11.3307	10.2342	11.3307	10.9652	11.3307	10.9652	11.3307	11.3307	10.9652	11.3307	10.9652	11.3307 (231)
Lighting	30.1928	24.2218	21.8090	15.9782	12.3421	10.0836	11.2588	14.6347	19.0090	24.9408	28.1706	31.0320 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-30.1257	-46.6781	-73.9861	-89.4233	-99.9038	-94.3078	-92.8032	-85.6738	-72.8357	-55.9401	-34.2707	-25.3616 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-13.0861	-31.4102	-73.3073	-126.1296	-180.2419	-186.3250	-181.9561	-145.5135	-95.4222	-47.9261	-18.2022	-9.9568 (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												2957.8471 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												76.2000
Water heating fuel used												2680.6062 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:
(MEVDcentralised, Database: total watage = 4.6540, total flow = 29.0000, SFP = 0.1605)

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mechanical ventilation fans (SFP = 0.1605)	47.4099 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	133.4099 (231)
Electricity for lighting (calculated in Appendix L)	243.6733 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1910.7870 (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	4104.7495 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2957.8471	0.2100	621.1479 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2680.6062	0.2100	562.9273 (264)
Space and water heating			1184.0752 (265)
Pumps, fans and electric keep-hot	133.4099	0.1432	18.8939 (267)
Energy for lighting	243.6733	0.1490	36.3121 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-801.3099	0.1374	-110.1347
PV Unit electricity exported	-1109.4771	0.1227	-136.0817
Total			-246.2164 (269)
Total CO2, kg/year			993.0648 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.4600 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2957.8471	1.1300	3342.3672 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2680.6062	1.1300	3029.0850 (278)
Space and water heating			6371.4522 (279)
Pumps, fans and electric keep-hot	133.4099	1.5335	203.6088 (281)
Energy for lighting	243.6733	1.5547	378.8497 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-801.3099	1.5125	-1211.9467
PV Unit electricity exported	-1109.4771	0.4501	-499.3434
Total			-1711.2900 (283)
Total Primary energy kWh/year			5242.6207 (286)
Dwelling Primary energy Rate (DPER)			55.2100 (287)

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

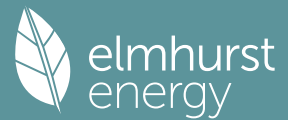
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	47.4800 (1b)	x 2.5000 (2b)	= 118.7000 (1b) - (3b)
First floor	47.4800 (1c)	x 2.6000 (2c)	= 123.4480 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	242.1480 (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) = 0.1239 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3739 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3178 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
Effective ac	0.4052	0.3973	0.3893	0.3496	0.3416	0.3019	0.3019	0.2940	0.3178	0.3416	0.3575	0.3734	(22b)
	0.5821	0.5789	0.5758	0.5611	0.5584	0.5456	0.5456	0.5432	0.5505	0.5584	0.5639	0.5697	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.1600	1.0000	2.1600		(26)
TER Opening Type			16.5700	1.1450	18.9733		(27)
GF			47.4800	0.1300	6.1724		(28a)
Main	100.2150	18.7300	81.4850	0.1800	14.6673		(29a)
PIJ	47.4800		47.4800	0.1100	5.2228		(30)
Total net area of external elements Aum(A, m2)			195.1750				(31)
Fabric heat loss, W/K = Sum (A x U)					47.1958		(33)
Main dwelling							
Party Wall 1			43.6600	0.0000	0.0000		(32)

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

142.2601 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	13.9700	0.0500	0.6985
E3 Sill	13.9700	0.0500	0.6985
E4 Jamb	35.3200	0.0500	1.7660
E5 Ground floor (normal)	19.6500	0.1600	3.1440
E6 Intermediate floor within a dwelling	19.6500	0.0000	0.0000
E16 Corner (normal)	10.1900	0.0900	0.9171
E18 Party wall between dwellings	10.1900	0.0600	0.6114
P1 Party wall - Ground floor	8.5700	0.0800	0.6856
P4 Party wall - Roof (insulation at ceiling level)	8.5700	0.1200	1.0284
E10 Eaves (insulation at ceiling level)	8.5700	0.0600	0.5142
E12 Gable (insulation at ceiling level)	11.0800	0.0600	0.6648
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			10.7285 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 57.9243 (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	46.5146	46.2598	46.0101	44.8373	44.6179	43.5964	43.5964	43.4073	43.9899	44.6179	45.0618	45.5259	(38)
Heat transfer coeff	104.4388	104.1841	103.9344	102.7616	102.5422	101.5207	101.5207	101.3315	101.9142	102.5422	102.9861	103.4502	(39)
Average = Sum(39)m / 12 =												102.7606	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0998	1.0971	1.0945	1.0822	1.0798	1.0691	1.0691	1.0671	1.0732	1.0798	1.0845	1.0894	(40)
HLP (average)												1.0821	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

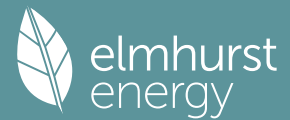
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6877 (42)
Hot water usage for mixer showers	69.2839	68.2427	66.7255	63.8225	61.6802	59.2911	57.9332	59.4389	61.0895	63.6547	66.6200	69.0185 (42a)	
Hot water usage for baths	29.9176	29.4733	28.8476	27.6939	26.8300	25.8722	25.3548	25.9761	26.6526	27.6776	28.8550	29.8164 (42b)	
Hot water usage for other uses	42.1549	40.6220	39.0891	37.5562	36.0233	34.4904	34.4904	36.0233	37.5562	39.0891	40.6220	42.1549 (42c)	
Average daily hot water use (litres/day)												129.9384 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	141.3564	138.3380	134.6621	129.0726	124.5335	119.6537	117.7783	121.4383	125.2983	130.4213	136.0969	140.9898 (44)	
Distribution loss (46)m = 0.15 x (45)m	223.8740	196.9914	206.9707	176.6939	167.6461	147.1282	142.4427	150.3660	154.5053	176.9805	193.8950	220.7559 (45)	
	33.5811	29.5487	31.0456	26.5041	25.1469	22.0692	21.3664	22.5549	23.1758	26.5471	29.0843	33.1134 (46)	
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)	
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)	
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)	
Total heat required for water heating calculated for each month	274.8329	243.0188	257.9296	226.0090	218.6050	196.4432	193.4016	201.3249	203.8204	227.9394	243.2101	271.7149 (62)	
WWHRS	-31.6737	-28.0125	-29.3331	-24.2889	-22.6364	-19.3701	-18.1564	-19.3075	-20.0411	-23.6262	-26.7657	-31.0872 (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	243.1592	215.0063	228.5965	201.7201	195.9686	177.0731	175.2452	182.0173	183.7793	204.3131	216.4444	240.6277 (64)	
12Total per year (kWh/year)												2463.9507 (64)	
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)	
												0.0000 (64a)	
Heat gains from water heating, kWh/month	87.1778	77.0065	81.5575	71.0795	68.4820	61.2489	60.1019	62.7364	63.7018	71.5857	76.7989	86.1411 (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	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	128.3738	142.1281	128.3738	132.6529	128.3738	132.6529	128.3738	128.3738	132.6529	128.3738	132.6529	128.3738	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	247.9131	250.4856	244.0029	230.2018	212.7805	196.4068	185.4683	182.8957	189.3785	203.1795	220.6009	236.9745	(68)

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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5											
Pumps, fans	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386 (69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086 (71)
Total internal gains	117.1745	114.5930	109.6203	98.7215	92.0458	85.0679	80.7821	84.3231	88.4747	96.2174	106.6651 (72)
	559.7771	573.5225	548.3127	527.8920	499.5157	477.4434	457.9399	458.9084	473.8218	494.0864	526.2346 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				4.7000	10.6334	0.6300		0.7000		0.7700		15.2736 (74)
South				6.5800	46.7521	0.6300		0.7000		0.7700		94.0153 (78)
West				5.2900	19.6403	0.6300		0.7000		0.7700		31.7523 (80)
Solar gains	141.0412	245.2756	348.0259	450.5307	521.1545	524.3591	502.6579	449.0980	383.4901	274.5231	169.8735	120.0822 (83)
Total gains	700.8183	818.7982	896.3386	978.4227	1020.6703	1001.8025	960.5978	908.0064	857.3119	768.6095	696.1081	667.5273 (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	35.9302	36.0180	36.1046	36.5166	36.5948	36.9630	36.9630	37.0320	36.8203	36.5948	36.4370	36.2736
alpha	3.3953	3.4012	3.4070	3.4344	3.4397	3.4642	3.4642	3.4688	3.4547	3.4397	3.4291	3.4182
util living area	0.9724	0.9534	0.9232	0.8570	0.7478	0.5891	0.4469	0.4873	0.6934	0.8819	0.9548	0.9763 (86)
MIT	19.1550	19.4418	19.8184	20.2936	20.6675	20.8957	20.9695	20.9586	20.8098	20.3214	19.6628	19.1084 (87)
Th 2	20.0010	20.0032	20.0053	20.0154	20.0173	20.0262	20.0262	20.0278	20.0228	20.0173	20.0135	20.0095 (88)
util rest of house	0.9673	0.9449	0.9090	0.8303	0.7008	0.5164	0.3552	0.3942	0.6256	0.8539	0.9451	0.9718 (89)
MIT 2	17.8579	18.2198	18.6913	19.2769	19.7091	19.9507	20.0112	20.0060	19.8718	19.3242	18.5098	17.8045 (90)
Living area fraction	FLA = Living area / (4) =											
MIT	18.1010	18.4489	18.9026	19.4675	19.8887	20.1279	20.1909	20.1846	20.0476	19.5111	18.7260	18.0489 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.1010	18.4489	18.9026	19.4675	19.8887	20.1279	20.1909	20.1846	20.0476	19.5111	18.7260	18.0489 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9536	0.9275	0.8893	0.8130	0.6941	0.5244	0.3712	0.4098	0.6275	0.8366	0.9283	0.9594 (94)
Useful gains	668.3309	759.4625	797.1490	795.4965	708.4191	525.3402	356.5552	372.1145	537.9883	642.9870	646.2162	640.3978 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1441.3648	1411.5797	1289.0536	1085.9304	839.6920	561.1932	364.5458	383.4985	606.1498	913.7660	1197.3125	1432.6759 (97)
Space heating kWh	575.1373	438.2228	365.9770	209.1124	97.6671	0.0000	0.0000	0.0000	0.0000	201.4596	396.7893	589.4549 (98a)
Space heating requirement - total per year (kWh/year)	2873.8203											
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	575.1373	438.2228	365.9770	209.1124	97.6671	0.0000	0.0000	0.0000	0.0000	201.4596	396.7893	589.4549 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2873.8203											
Space heating per m2	(98c) / (4) = 30.2635 (99)											

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (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	575.1373	438.2228	365.9770	209.1124	97.6671	0.0000	0.0000	0.0000	0.0000	201.4596	396.7893	589.4549 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	622.4429	474.2671	396.0790	226.3121	105.7003	0.0000	0.0000	0.0000	0.0000	218.0298	429.4256	637.9382 (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	243.1592	215.0063	228.5965	201.7201	195.9686	177.0731	175.2452	182.0173	183.7793	204.3131	216.4444	240.6277 (64)
Efficiency of water heater (217)m	86.1581	85.8729	85.3842	84.4587	82.9697	80.3000	80.3000	80.3000	80.3000	84.3513	85.6619	80.3000 (216)
Fuel for water heating, kWh/month	282.2245	250.3773	267.7270	238.8388	236.1930	220.5144	218.2381	226.6717	228.8659	242.2170	252.6730	279.0756 (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	26.6735	21.3985	19.2670	14.1158	10.9035	8.9082	9.9465	12.9288	16.7933	22.0337	24.8870	27.4149 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-43.6531	-61.1513	-87.3400	-97.5430	-104.6074	-97.4028	-96.1601	-91.0357	-81.9414	-69.5763	-47.8369	-37.7835 (233a)

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Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-25.8670	-54.2747	-107.6314	-161.3194	-213.0027	-213.9394	-211.4575	-179.2100	-131.5565	-77.5488	-34.5103	-20.4688	(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												3110.1951	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2943.6162	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												215.2708	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2346.8179	(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												4008.2641	(238)

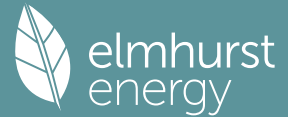
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3110.1951	0.2100	653.1410	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2943.6162	0.2100	618.1594	(264)
Space and water heating			1271.3004	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	215.2708	0.1443	31.0702	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-916.0315	0.1347	-123.4189	
PV Unit electricity exported	-1430.7865	0.1260	-180.2126	
Total			-303.6315	(269)
Total CO2, kg/year			1010.6684	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.6400	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3110.1951	1.1300	3514.5205	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2943.6162	1.1300	3326.2863	(278)
Space and water heating			6840.8068	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	215.2708	1.5338	330.1895	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-916.0315	1.4980	-1372.1744	
PV Unit electricity exported	-1430.7865	0.4623	-661.5074	
Total			-2033.6818	(283)
Total Primary energy kWh/year			5267.4152	(286)
Target Primary Energy Rate (TPER)			55.4700	(287)

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Property Reference	HT11-Semi			Issued on Date	07/05/2025
Assessment Reference	001	Prop Type Ref			
Property	Highmoor Lane, CLECKHEATON, BD19 6LW				
SAP Rating	94 A	DER	10.46	TER	10.64
Environmental	91 B	% DER < TER			1.69
CO ₂ Emissions (t/year)	0.98	DFEE	35.02	TFEE	35.59
Compliance Check	See BREL	% DFEE < TFEE			1.61
% DPER < TPER	0.47	DPER	55.21	TPER	55.47
Assessor Details	Mr. Paul Goddard			Assessor ID	B342-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	47.4800 (1b)	x 2.5000 (2b)	= 118.7000 (1b) - (3b)
First floor	47.4800 (1c)	x 2.6000 (2c)	= 123.4480 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 242.1480 (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) = 0.1239 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3239 (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) = 0.2753 (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	0.3510	0.3441	0.3373	0.3028	0.2960	0.2615	0.2615	0.2547	0.2753	0.2960	0.3097	0.3235 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5616	0.5592	0.5569	0.5459	0.5438	0.5342	0.5342	0.5324	0.5379	0.5438	0.5480	0.5523 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			2.1600	1.0000	2.1600		(26)
Window			13.2400	1.1450	15.1603		(27)
Patio Door			3.3300	1.3258	4.4148		(27)
GF			47.4800	0.1100	5.2228	9.0000	427.3200 (28a)
Main	100.2150	18.7300	81.4850	0.1800	14.6673	18.0000	1466.7299 (29a)
PIJ	47.4800		47.4800	0.0900	4.2732	9.0000	427.3200 (30)
Total net area of external elements Aum(A, m ²)			195.1750				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.8984		(33)
Main dwelling							
Party Wall 1			43.6600	0.0000	0.0000	20.0000	873.2000 (32)
Internal Wall 1			120.4500			75.0000	9033.7498 (32c)
Internal Floor 1			47.4100			18.0000	853.3800 (32d)
Internal Ceiling 1			47.4800			9.0000	427.3200 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13509.0197 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							142.2601 (35)
List of Thermal Bridges							

elmhurst
energy

Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)m \times (5)$												
(38)m	Jan 44.8773	Feb 44.6862	Mar 44.4988	Apr 43.6187	May 43.4540	Jun 42.6875	Jul 42.6875	Aug 42.5455	Sep 42.9827	Oct 43.4540	Nov 43.7871	Dec 44.1354 (38)
Heat transfer coeff	101.7007	101.5095	101.3222	100.4421	100.2774	99.5108	99.5108	99.3689	99.8061	100.2774	100.6105	100.9588 (39)
Average = Sum(39)m / 12 =												100.4413
HLP	Jan 1.0710	Feb 1.0690	Mar 1.0670	Apr 1.0577	May 1.0560	Jun 1.0479	Jul 1.0479	Aug 1.0464	Sep 1.0510	Oct 1.0560	Nov 1.0595	Dec 1.0632 (40)
HLP (average)												1.0577
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												
Hot water usage for mixer showers												2.6877 (42)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	29.9176	29.4733	28.8476	27.6939	26.8300	25.8722	25.3548	25.9761	26.6526	27.6776	28.8550	29.8164 (42b)
Hot water usage for other uses	42.1549	40.6220	39.0891	37.5562	36.0233	34.4904	34.4904	36.0233	37.5562	39.0891	40.6220	42.1549 (42c)
Average daily hot water use (litres/day)												66.0609 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	72.0725	70.0952	67.9366	65.2501	62.8533	60.3625	59.8451	61.9994	64.2088	66.7666	69.4770	71.9713 (44)
Energy content (annual)	114.1452	99.8147	104.4161	89.3241	84.6127	74.2228	72.3775	76.7682	79.1758	90.6017	98.9827	112.6897 (45)
Distribution loss	Total = Sum(45)m =											1097.1311
(46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	97.0234	84.8425	88.7537	75.9255	71.9208	63.0894	61.5209	65.2529	67.2995	77.0114	84.1353	95.7863 (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	97.0234	84.8425	88.7537	75.9255	71.9208	63.0894	61.5209	65.2529	67.2995	77.0114	84.1353	95.7863 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											932.5614 (64a)
Electric shower(s)												933 (64)
	55.4849	49.4375	53.9838	51.5161	52.4828	50.0635	51.7323	52.4828	51.5161	53.9838	52.9687	55.4849 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											631.1372 (64a)
Heat gains from water heating, kWh/month	38.1271	33.5700	35.6844	31.8604	31.1009	28.2882	28.3133	29.4339	29.7039	32.7488	34.2760	37.8178 (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	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	128.3738	142.1281	128.3738	132.6529	128.3738	132.6529	128.3738	128.3738	132.6529	128.3738	132.6529	128.3738	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	247.9131	250.4856	244.0029	230.2018	212.7805	196.4068	185.4683	182.8957	189.3785	203.1795	220.6009	236.9745	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	(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)	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	(71)
Water heating gains (Table 5)	51.2461	49.9553	47.9629	44.2506	41.8023	39.2892	38.0555	39.5617	41.2554	44.0172	47.6056	50.8304	(72)
Total internal gains	490.8487	505.8849	483.6553	470.4210	446.2723	431.6647	415.2133	414.1470	426.6025	438.8863	464.1751	479.4944	(73)

6. Solar gains													
[Jan]				Area	Solar flux		g		FF		Access		Gains
				m2	Table 6a		Specific data		Specific data		factor		W
					W/m2		or Table 6b		or Table 6c		Table 6d		
North				4.7000	10.6334		0.3300		0.0000		0.7700		12.6991 (74)
South				3.2500	46.7521		0.3300		0.0000		0.7700		38.6090 (78)
West				5.2900	19.6403		0.3300		0.0000		0.7700		26.4002 (80)
South				3.3300	46.7521		0.6300		0.7000		0.7700		47.5792 (78)
Solar gains	125.2876	217.0672	306.0947	393.5004	453.0154	454.9382	436.4599	391.3931	336.3277	242.4171	150.7464	106.7714	(83)

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Total gains 616.1362 722.9521 789.7500 863.9214 899.2877 886.6029 851.6732 805.5401 762.9302 681.3034 614.9215 586.2658 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	36.8975	36.9670	37.0354	37.3599	37.4213	37.7095	37.7095	37.7634	37.5980	37.4213	37.2974	37.1687
alpha	3.4598	3.4645	3.4690	3.4907	3.4948	3.5140	3.5140	3.5176	3.5065	3.4948	3.4865	3.4779
util living area	0.9807	0.9661	0.9427	0.8880	0.7914	0.6367	0.4887	0.5312	0.7367	0.9081	0.9672	0.9836 (86)
MIT	19.0848	19.3609	19.7302	20.2125	20.6118	20.8725	20.9619	20.9485	20.7771	20.2544	19.5886	19.0362 (87)
Th 2	20.0246	20.0263	20.0279	20.0355	20.0369	20.0436	20.0436	20.0448	20.0410	20.0369	20.0340	20.0310 (88)
util rest of house	0.9770	0.9597	0.9316	0.8654	0.7483	0.5638	0.3924	0.4343	0.6718	0.8849	0.9600	0.9804 (89)
MIT 2	18.2790	18.5522	18.9152	19.3839	19.7503	19.9699	20.0286	20.0231	19.8995	19.4332	18.7855	18.2355 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.4301	18.7038	19.0680	19.5392	19.9118	20.1391	20.2036	20.1966	20.0640	19.5871	18.9360	18.3856 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.4301	18.7038	19.0680	19.5392	19.9118	20.1391	20.2036	20.1966	20.0640	19.5871	18.9360	18.3856 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9688	0.9484	0.9179	0.8518	0.7421	0.5716	0.4091	0.4505	0.6735	0.8717	0.9491	0.9731 (94)
Useful gains	596.9027	685.6636	724.8923	735.8596	667.3619	506.7523	348.4552	362.8816	513.8521	593.8990	583.6186	570.4760 (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	1437.0379	1401.2137	1273.4124	1068.6274	823.4592	551.1985	358.5942	377.2625	595.2423	901.2077	1190.8270	1432.1625 (97)
Space heating kWh	625.0606	480.8497	408.0989	239.5928	116.1364	0.0000	0.0000	0.0000	0.0000	228.6377	437.1901	641.0948 (98a)
Space heating requirement - total per year (kWh/year)	3176.6609											
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	625.0606	480.8497	408.0989	239.5928	116.1364	0.0000	0.0000	0.0000	0.0000	228.6377	437.1901	641.0948 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	3176.6609											
Space heating per m2	(98c) / (4) = 33.4526 (99)											

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W												
	0.0000	0.0000	0.0000	0.0000	0.0000	935.4020	736.3803	755.2036	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7974	0.8639	0.8390	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	745.8535	636.1724	633.5920	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	982.9802	944.7268	893.3571	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	170.7313	229.5645	193.2652	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											
Intermittency factor (Table 10b)												1.0000 (105)
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	42.6828	57.3911	48.3163	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement	148.3902 (107)											
Energy for space heating	33.4526 (99)											
Energy for space cooling	1.5627 (108)											
Total	35.0153 (109)											
Fabric Energy Efficiency (DFEE)	35.0 (109)											

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

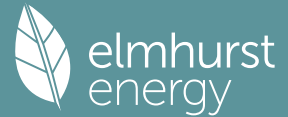
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	47.4800 (1b)	x 2.5000 (2b)	= 118.7000 (1b) - (3b)
First floor	47.4800 (1c)	x 2.6000 (2c)	= 123.4480 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 242.1480 (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)

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Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1239 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3739	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3178 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000	(22)
Wind factor	Jan 1.2750 Feb 1.2500 Mar 1.2250 Apr 1.1000 May 1.0750 Jun 0.9500 Jul 0.9500 Aug 0.9250 Sep 1.0000 Oct 1.0750 Nov 1.1250 Dec 1.1750	(22a)
Adj infilt rate	0.4052 0.3973 0.3893 0.3496 0.3416 0.3019 0.3019 0.2940 0.3178 0.3416 0.3575 0.3734	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		0.0000 (23c)
Effective ac	0.5821 0.5789 0.5758 0.5611 0.5584 0.5456 0.5456 0.5432 0.5505 0.5584 0.5639 0.5697	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.1600	1.0000	2.1600		(26)
TER Opening Type			16.5700	1.1450	18.9733		(27)
GF			47.4800	0.1300	6.1724		(28a)
Main	100.2150	18.7300	81.4850	0.1800	14.6673		(29a)
PIJ	47.4800		47.4800	0.1100	5.2228		(30)
Total net area of external elements Aum (A, m2)			195.1750				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	47.1958	(33)
Main dwelling							
Party Wall 1			43.6600	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							142.2601 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				13.9700	0.0500	0.6985	
E3 Sill				13.9700	0.0500	0.6985	
E4 Jamb				35.3200	0.0500	1.7660	
E5 Ground floor (normal)				19.6500	0.1600	3.1440	
E6 Intermediate floor within a dwelling				19.6500	0.0000	0.0000	
E16 Corner (normal)				10.1900	0.0900	0.9171	
E18 Party wall between dwellings				10.1900	0.0600	0.6114	
P1 Party wall - Ground floor				8.5700	0.0800	0.6856	
P4 Party wall - Roof (insulation at ceiling level)				8.5700	0.1200	1.0284	
E10 Eaves (insulation at ceiling level)				8.5700	0.0600	0.5142	
E12 Gable (insulation at ceiling level)				11.0800	0.0600	0.6648	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7285 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	57.9243 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	Jan 46.5146 Feb 46.2598 Mar 46.0101 Apr 44.8373 May 44.6179 Jun 43.5964 Jul 43.5964 Aug 43.4073 Sep 43.9899 Oct 44.6179 Nov 45.0618 Dec 45.5259						(38)
Heat transfer coeff	104.4388 104.1841 103.9344 102.7616 102.5422 101.5207 101.5207 101.3315 101.9142 102.5422 102.9861 103.4502						(39)
Average = Sum(39)m / 12 =							102.7606
HLP	Jan 1.0998 Feb 1.0971 Mar 1.0945 Apr 1.0822 May 1.0798 Jun 1.0691 Jul 1.0691 Aug 1.0671 Sep 1.0732 Oct 1.0798 Nov 1.0845 Dec 1.0894						(40)
HLP (average)							1.0821
Days in mont	31 28 31 30 31 30 31 31 30 31 30 31						

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6877 (42)
Hot water usage for mixer showers												0.0000 (42a)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000												
Hot water usage for baths												29.9176 29.4733 28.8476 27.6939 26.8300 25.8722 25.3548 25.9761 26.6526 27.6776 28.8550 29.8164 (42b)
Hot water usage for other uses												42.1549 40.6220 39.0891 37.5562 36.0233 34.4904 34.4904 36.0233 37.5562 39.0891 40.6220 42.1549 (42c)
Average daily hot water use (litres/day)												66.0609 (43)
Daily hot water use	Jan 72.0725 Feb 70.0952 Mar 67.9366 Apr 65.2501 May 62.8533 Jun 60.3625 Jul 59.8451 Aug 61.9994 Sep 64.2088 Oct 66.7666 Nov 69.4770 Dec 71.9713 (44)											
Energy conte	114.1452 99.8147 104.4161 89.3241 84.6127 74.2228 72.3775 76.7682 79.1758 90.6017 98.9827 112.6897 (45)											
Energy content (annual)												Total = Sum(45)m = 1097.1311
Distribution loss (46)m = 0.15 x (45)m												0.0000 (46)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000												
Water storage loss:												
Total storage loss	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (56)											
If cylinder contains dedicated solar storage												
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (57)												
Primary loss	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (59)											
Combi loss	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)											
Total heat required for water heating calculated for each month												
97.0234 84.8425 88.7537 75.9255 71.9208 63.0894 61.5209 65.2529 67.2995 77.0114 84.1353 95.7863 (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	97.0234 84.8425 88.7537 75.9255 71.9208 63.0894 61.5209 65.2529 67.2995 77.0114 84.1353 95.7863 (64)											
Total per year (kWh/year) = Sum(64)m =												932.5614 (64)
12Total per year (kWh/year)												933 (64)

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Electric shower(s)	55.4849	49.4375	53.9838	51.5161	52.4828	50.0635	51.7323	52.4828	51.5161	53.9838	52.9687	55.4849 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												631.1372 (64a)
Heat gains from water heating, kWh/month	38.1271	33.5700	35.6844	31.8604	31.1009	28.2882	28.3133	29.4339	29.7039	32.7488	34.2760	37.8178 (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	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	128.3738	142.1281	128.3738	132.6529	128.3738	132.6529	128.3738	128.3738	132.6529	128.3738	132.6529	128.3738	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	247.9131	250.4856	244.0029	230.2018	212.7805	196.4068	185.4683	182.8957	189.3785	203.1795	220.6009	236.9745	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	(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)	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	(71)
Water heating gains (Table 5)	51.2461	49.9553	47.9629	44.2506	41.8023	39.2892	38.0555	39.5617	41.2554	44.0172	47.6056	50.8304	(72)
Total internal gains	490.8487	505.8849	483.6553	470.4210	446.2723	431.6647	415.2133	414.1470	426.6025	438.8863	464.1751	479.4944	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
North	4.7000	10.6334	0.6300	0.7000	0.7700	15.2736 (74)
South	6.5800	46.7521	0.6300	0.7000	0.7700	94.0153 (78)
West	5.2900	19.6403	0.6300	0.7000	0.7700	31.7523 (80)

Solar gains	141.0412	245.2756	348.0259	450.5307	521.1545	524.3591	502.6579	449.0980	383.4901	274.5231	169.8735	120.0822 (83)
Total gains	631.8898	751.1605	831.6812	920.9518	967.4268	956.0238	917.8711	863.2450	810.0926	713.4094	634.0486	599.5766 (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	35.9302	36.0180	36.1046	36.5166	36.5948	36.9630	36.9630	37.0320	36.8203	36.5948	36.4370	36.2736
alpha	3.3953	3.4012	3.4070	3.4344	3.4397	3.4642	3.4642	3.4688	3.4547	3.4397	3.4291	3.4182
util living area	0.9795	0.9630	0.9362	0.8743	0.7692	0.6101	0.4652	0.5087	0.7178	0.9002	0.9649	0.9826 (86)
MIT	19.0463	19.3424	19.7334	20.2354	20.6342	20.8836	20.9655	20.9527	20.7871	20.2593	19.5707	18.9995 (87)
Th 2	20.0010	20.0032	20.0053	20.0154	20.0173	20.0262	20.0262	20.0278	20.0228	20.0173	20.0135	20.0095 (88)
util rest of house	0.9755	0.9560	0.9239	0.8497	0.7237	0.5367	0.3707	0.4129	0.6510	0.8753	0.9571	0.9792 (89)
MIT 2	18.2241	18.5169	18.9007	19.3877	19.7506	19.9599	20.0129	20.0082	19.8894	19.4215	18.7527	18.1839 (90)
Living area fraction	18.3782	18.6716	19.0568	19.5466	19.9162	20.1331	20.1914	20.1853	20.0577	19.5785	18.9060	18.3368 (92)
MIT	18.3782	18.6716	19.0568	19.5466	19.9162	20.1331	20.1914	20.1853	20.0577	19.5785	18.9060	18.3368 (93)
Temperature adjustment												0.0000
adjusted MIT	18.3782	18.6716	19.0568	19.5466	19.9162	20.1331	20.1914	20.1853	20.0577	19.5785	18.9060	18.3368 (93)

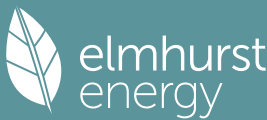
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9668	0.9440	0.9094	0.8360	0.7185	0.5452	0.3873	0.4291	0.6536	0.8618	0.9456	0.9714	(94)
Useful gains	610.8942	709.1105	756.3449	769.9542	695.1037	521.2385	355.4826	370.4332	529.5036	614.8491	599.5824	582.4538	(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	1470.3156	1434.7858	1305.0825	1094.0644	842.5074	561.7224	364.6042	383.5658	607.1710	920.6797	1215.8556	1462.4556	(97)
Space heating kWh	639.4095	487.6538	408.2608	233.3593	109.6684	0.0000	0.0000	0.0000	0.0000	227.5380	443.7168	654.7213	(98a)
Space heating requirement - total per year (kWh/year)												3204.3278	
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	639.4095	487.6538	408.2608	233.3593	109.6684	0.0000	0.0000	0.0000	0.0000	227.5380	443.7168	654.7213	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3204.3278	
Space heating per m2											(98c) / (4) =	33.7440	(99)

8c. Space cooling requirement

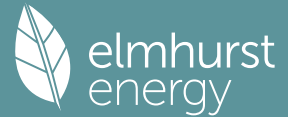
Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan 4.3000	Feb 4.9000	Mar 6.5000	Apr 8.9000	May 11.7000	Jun 14.6000	Jul 16.6000	Aug 16.4000	Sep 14.1000	Oct 10.6000	Nov 7.1000	Dec 4.2000
Heat loss rate W												
	0.0000	0.0000	0.0000	0.0000	0.0000	954.2946	751.2532	770.1197	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8162	0.8779	0.8533	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	778.9310	659.5251	657.1209	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1064.1215	1022.1011	960.8043	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	205.3372	269.7565	225.9404	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	51.3343	67.4391	56.4851	0.0000	0.0000	0.0000	0.0000 (107)

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Space cooling requirement	175.2585 (107)
Energy for space heating	33.7440 (99)
Energy for space cooling	1.8456 (108)
Total	35.5896 (109)
Fabric Energy Efficiency (TFEE)	35.6 (109)

Full SAP Calculation Printout



Property Reference	HT11-Semi				Issued on Date	07/05/2025
Assessment Reference	001	Prop Type Ref				
Property	Highmoor Lane, CLECKHEATON, BD19 6LW					
SAP Rating	94 A	DER	10.46	TER	10.64	
Environmental	91 B	% DER < TER				1.69
CO ₂ Emissions (t/year)	0.98	DFEE	35.02	TFEE	35.59	
Compliance Check	See BREL	% DFEE < TFEE				1.61
% DPER < TPER	0.47	DPER	55.21	TPER	55.47	
Assessor Details	Mr. Paul Goddard				Assessor ID	B342-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	47.4800 (1b)	x 2.5000 (2b)	= 118.7000 (1b) - (3b)
First floor	47.4800 (1c)	x 2.6000 (2c)	= 123.4480 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 242.1480 (5)

2. Ventilation rate

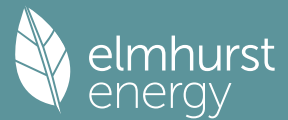
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.2000 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1700 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			2.1600	1.0000	2.1600		(26)
Window			13.2400	1.1450	15.1603		(27)
Patio Door			3.3300	1.3258	4.4148		(27)
GF			47.4800	0.1100	5.2228	9.0000	427.3200 (28a)
Main	100.2150	18.7300	81.4850	0.1800	14.6673	18.0000	1466.7299 (29a)
PIJ	47.4800		47.4800	0.0900	4.2732	9.0000	427.3200 (30)
Total net area of external elements Aum(A, m ²)			195.1750				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.8984		(33)
Main dwelling							
Party Wall 1			43.6600	0.0000	0.0000	20.0000	873.2000 (32)
Internal Wall 1			120.4500			75.0000	9033.7498 (32c)
Internal Floor 1			47.4100			18.0000	853.3800 (32d)
Internal Ceiling 1			47.4800			9.0000	427.3200 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13509.0197 (34)

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Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												142.2601 (35)
List of Thermal Bridges												
K1 Element												
E2 Other lintels (including other steel lintels)												
E3 Sill												
E4 Jamb												
E5 Ground floor (normal)												
E6 Intermediate floor within a dwelling												
E16 Corner (normal)												
E18 Party wall between dwellings												
P1 Party wall - Ground floor												
P4 Party wall - Roof (insulation at ceiling level)												
E10 Eaves (insulation at ceiling level)												
E12 Gable (insulation at ceiling level)												
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												10.9250 (36)
Point Thermal bridges												0.0000
Total fabric heat loss												(33) + (36) + (36a) = 56.8234 (37)

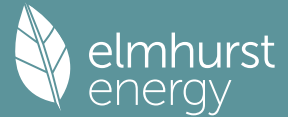
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544	39.9544
Average = Sum(39)m / 12 =	96.7778	96.7778	96.7778	96.7778	96.7778	96.7778	96.7778	96.7778	96.7778	96.7778	96.7778	96.7778
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0191	1.0191	1.0191	1.0191	1.0191	1.0191	1.0191	1.0191	1.0191	1.0191	1.0191	1.0191
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.6877 (42)
Hot water usage for mixer showers												
Hot water usage for baths												
Hot water usage for other uses												
Average daily hot water use (litres/day)												129.9384 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	141.3564	138.3380	134.6621	129.0726	124.5335	119.6537	117.7783	121.4383	125.2983	130.4213	136.0969	140.9898
Energy content (annual)	223.8740	196.9914	206.9707	176.6939	167.6461	147.1282	142.4427	150.3660	154.5053	176.9805	193.8950	220.7559
Distribution loss (46)m = 0.15 x (45)m												2158.2497
Water storage loss:												
Total storage loss												
If cylinder contains dedicated solar storage												
Primary loss												
Combi loss												
Total heat required for water heating calculated for each month												
WWHRS												
FV diverter												
Solar input												
FGHRS												
Output from w/h												
12Total per year (kWh/year)												
Electric shower(s)												
Heat gains from water heating, kWh/month												

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	128.3738	142.1281	128.3738	132.6529	128.3738	132.6529	128.3738	128.3738	132.6529	128.3738	132.6529	128.3738
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	247.9131	250.4856	244.0029	230.2018	212.7805	196.4068	185.4683	182.8957	189.3785	203.1795	220.6009	236.9745
Pumps, fans	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000
Water heating gains (Table 5)	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086
Total internal gains	100.5757	98.0051	93.0331	82.1089	75.4195	68.4228	64.1167	67.6629	71.8203	79.5803	90.0502	99.1780

6. Solar gains						
[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	4.7000	10.6334	0.3300	0.0000	0.7700	12.6991 (74)
South	3.2500	46.7521	0.3300	0.0000	0.7700	38.6090 (78)
West	5.2900	19.6403	0.3300	0.0000	0.7700	26.4002 (80)
South	3.3300	46.7521	0.6300	0.7000	0.7700	47.5792 (78)

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Solar gains	125.2876	217.0672	306.0947	393.5004	453.0154	454.9382	436.4599	391.3931	336.3277	242.4171	150.7464	106.7714 (83)
Total gains	668.4659	774.0018	837.8203	904.7798	935.9049	915.7365	877.7344	833.6412	793.4950	719.8664	660.3661	637.6134 (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	38.7744	38.7744	38.7744	38.7744	38.7744	38.7744	38.7744	38.7744	38.7744	38.7744	38.7744	38.7744
alpha	3.5850	3.5850	3.5850	3.5850	3.5850	3.5850	3.5850	3.5850	3.5850	3.5850	3.5850	3.5850
util living area	0.9748	0.9573	0.9300	0.8700	0.7664	0.6117	0.4658	0.5062	0.7101	0.8909	0.9587	0.9785 (86)
MIT	19.2865	19.5484	19.8913	20.3181	20.6753	20.8948	20.9698	20.9588	20.8147	20.3513	19.7350	19.2201 (87)
Th 2	20.0674	20.0674	20.0674	20.0674	20.0674	20.0674	20.0674	20.0674	20.0674	20.0674	20.0674	20.0674 (88)
util rest of house	0.9702	0.9497	0.9171	0.8455	0.7222	0.5407	0.3747	0.4141	0.6451	0.8651	0.9499	0.9745 (89)
MIT 2	18.0674	18.3970	18.8260	19.3476	19.7622	19.9899	20.0522	20.0452	19.9179	19.3984	18.6367	17.9834 (90)
Living area fraction									fLA = Living area /			0.1874 (91)
MIT	18.2959	18.6128	19.0257	19.5295	19.9333	20.1595	20.2242	20.2165	20.0860	19.5770	18.8426	18.2152 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.1459	18.4628	18.8757	19.3795	19.7833	20.0095	20.0742	20.0665	19.9360	19.4270	18.6926	18.0652 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9568	0.9322	0.8964	0.8242	0.7071	0.5360	0.3754	0.4140	0.6350	0.8434	0.9325	0.9623 (94)
Useful gains	639.5858	721.5320	751.0425	745.6926	661.8178	490.7908	329.4899	345.1028	503.8584	607.1192	615.8102	613.5877 (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	1339.9772	1312.5765	1197.6897	1014.1864	782.2886	523.5199	336.2237	354.8320	564.7923	854.2616	1121.9046	1341.8459 (97)
Space heating kWh	521.0912	397.1819	332.3055	193.3155	89.6302	0.0000	0.0000	0.0000	0.0000	183.8740	364.3879	541.8241 (98a)
Space heating requirement - total per year (kWh/year)												2623.6104
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	521.0912	397.1819	332.3055	193.3155	89.6302	0.0000	0.0000	0.0000	0.0000	183.8740	364.3879	541.8241 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2623.6104
Space heating per m2										(98c) / (4) =		27.6286 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												88.7000 (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	521.0912	397.1819	332.3055	193.3155	89.6302	0.0000	0.0000	0.0000	0.0000	183.8740	364.3879	541.8241 (98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)
Space heating fuel (main heating system)	587.4760	447.7812	374.6398	217.9431	101.0488	0.0000	0.0000	0.0000	0.0000	207.2987	410.8094	610.8502 (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	225.4350	198.4304	208.5663	178.1647	169.1253	148.5053	143.8053	151.7439	155.8556	178.4274	195.3592	222.3041 (64)
Efficiency of water heater												76.2000 (216)
(217)m	84.5134	84.1036	83.4230	82.2305	80.1106	76.2000	76.2000	76.2000	76.2000	82.0698	83.8967	84.6597 (217)
Fuel for water heating, kWh/month	266.7445	235.9356	250.0106	216.6652	211.1148	194.8888	188.7209	199.1390	204.5349	217.4095	232.8569	262.5855 (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	11.3307	10.2342	11.3307	10.9652	11.3307	10.9652	11.3307	11.3307	10.9652	11.3307	10.9652	11.3307 (231)
Lighting	30.1928	24.2218	21.8090	15.9782	12.3421	10.0836	11.2588	14.6347	19.0090	24.9408	28.1706	31.0320 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-30.1257	-46.6781	-73.9861	-89.4233	-99.9038	-94.3078	-92.8032	-85.6738	-72.8357	-55.9401	-34.2707	-25.3616 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-13.0861	-31.4102	-73.3073	-126.1296	-180.2419	-186.3250	-181.9561	-145.5135	-95.4222	-47.9261	-18.2022	-9.9568 (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												2957.8471 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												76.2000
Water heating fuel used												2680.6062 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:
(MEVDcentralised, Database: total watage = 4.6540, total flow = 29.0000, SFP = 0.1605)

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mechanical ventilation fans (SFP = 0.1605)	47.4099 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	133.4099 (231)
Electricity for lighting (calculated in Appendix L)	243.6733 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1910.7870 (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	4104.7495 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2957.8471	0.2100	621.1479 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2680.6062	0.2100	562.9273 (264)
Space and water heating			1184.0752 (265)
Pumps, fans and electric keep-hot	133.4099	0.1432	18.8939 (267)
Energy for lighting	243.6733	0.1490	36.3121 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-801.3099	0.1374	-110.1347
PV Unit electricity exported	-1109.4771	0.1227	-136.0817
Total			-246.2164 (269)
Total CO2, kg/year			993.0648 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.4600 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2957.8471	1.1300	3342.3672 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2680.6062	1.1300	3029.0850 (278)
Space and water heating			6371.4522 (279)
Pumps, fans and electric keep-hot	133.4099	1.5335	203.6088 (281)
Energy for lighting	243.6733	1.5547	378.8497 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-801.3099	1.5125	-1211.9467
PV Unit electricity exported	-1109.4771	0.4501	-499.3434
Total			-1711.2900 (283)
Total Primary energy kWh/year			5242.6207 (286)
Dwelling Primary energy Rate (DPER)			55.2100 (287)

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

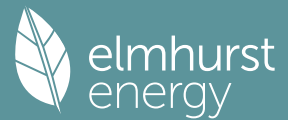
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	47.4800 (1b)	x 2.5000 (2b)	= 118.7000 (1b) - (3b)
First floor	47.4800 (1c)	x 2.6000 (2c)	= 123.4480 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	242.1480 (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) = 0.1239 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3739 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3178 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
Effective ac	0.4052	0.3973	0.3893	0.3496	0.3416	0.3019	0.3019	0.2940	0.3178	0.3416	0.3575	0.3734	(22b)
	0.5821	0.5789	0.5758	0.5611	0.5584	0.5456	0.5456	0.5432	0.5505	0.5584	0.5639	0.5697	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.1600	1.0000	2.1600		(26)
TER Opening Type			16.5700	1.1450	18.9733		(27)
GF			47.4800	0.1300	6.1724		(28a)
Main	100.2150	18.7300	81.4850	0.1800	14.6673		(29a)
PIJ	47.4800		47.4800	0.1100	5.2228		(30)
Total net area of external elements Aum(A, m2)			195.1750				(31)
Fabric heat loss, W/K = Sum (A x U)					47.1958		(33)
Main dwelling							
Party Wall 1			43.6600	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							142.2601 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value		Total
E2 Other lintels (including other steel lintels)				13.9700	0.0500		0.6985
E3 Sill				13.9700	0.0500		0.6985
E4 Jamb				35.3200	0.0500		1.7660
E5 Ground floor (normal)				19.6500	0.1600		3.1440
E6 Intermediate floor within a dwelling				19.6500	0.0000		0.0000
E16 Corner (normal)				10.1900	0.0900		0.9171
E18 Party wall between dwellings				10.1900	0.0600		0.6114
P1 Party wall - Ground floor				8.5700	0.0800		0.6856
P4 Party wall - Roof (insulation at ceiling level)				8.5700	0.1200		1.0284
E10 Eaves (insulation at ceiling level)				8.5700	0.0600		0.5142
E12 Gable (insulation at ceiling level)				11.0800	0.0600		0.6648
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7285 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	57.9243 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 46.5146	Feb 46.2598	Mar 46.0101	Apr 44.8373	May 44.6179	Jun 43.5964	Jul 43.5964	Aug 43.4073	Sep 43.9899	Oct 44.6179	Nov 45.0618	Dec 45.5259	(38)
Heat transfer coeff	104.4388	104.1841	103.9344	102.7616	102.5422	101.5207	101.5207	101.3315	101.9142	102.5422	102.9861	103.4502	(39)
Average = Sum(39)m / 12 =												102.7606	
HLP	Jan 1.0998	Feb 1.0971	Mar 1.0945	Apr 1.0822	May 1.0798	Jun 1.0691	Jul 1.0691	Aug 1.0671	Sep 1.0732	Oct 1.0798	Nov 1.0845	Dec 1.0894	(40)
HLP (average)												1.0821	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

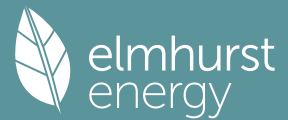
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6877 (42)
Hot water usage for mixer showers	69.2839	68.2427	66.7255	63.8225	61.6802	59.2911	57.9332	59.4389	61.0895	63.6547	66.6200	69.0185 (42a)	
Hot water usage for baths	29.9176	29.4733	28.8476	27.6939	26.8300	25.8722	25.3548	25.9761	26.6526	27.6776	28.8550	29.8164 (42b)	
Hot water usage for other uses	42.1549	40.6220	39.0891	37.5562	36.0233	34.4904	34.4904	36.0233	37.5562	39.0891	40.6220	42.1549 (42c)	
Average daily hot water use (litres/day)												129.9384 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	141.3564	138.3380	134.6621	129.0726	124.5335	119.6537	117.7783	121.4383	125.2983	130.4213	136.0969	140.9898 (44)	
Distribution loss (46)m = 0.15 x (45)m	223.8740	196.9914	206.9707	176.6939	167.6461	147.1282	142.4427	150.3660	154.5053	176.9805	193.8950	220.7559 (45)	
	33.5811	29.5487	31.0456	26.5041	25.1469	22.0692	21.3664	22.5549	23.1758	26.5471	29.0843	33.1134 (46)	
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)	
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)	
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)	
Total heat required for water heating calculated for each month	274.8329	243.0188	257.9296	226.0090	218.6050	196.4432	193.4016	201.3249	203.8204	227.9394	243.2101	271.7149 (62)	
WWHRS	-31.6737	-28.0125	-29.3331	-24.2889	-22.6364	-19.3701	-18.1564	-19.3075	-20.0411	-23.6262	-26.7657	-31.0872 (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	243.1592	215.0063	228.5965	201.7201	195.9686	177.0731	175.2452	182.0173	183.7793	204.3131	216.4444	240.6277 (64)	
12Total per year (kWh/year)												2463.9507 (64)	
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)	
												0.0000 (64a)	
Heat gains from water heating, kWh/month	87.1778	77.0065	81.5575	71.0795	68.4820	61.2489	60.1019	62.7364	63.7018	71.5857	76.7989	86.1411 (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	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	134.3858	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	128.3738	142.1281	128.3738	132.6529	128.3738	132.6529	128.3738	128.3738	132.6529	128.3738	132.6529	128.3738	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	247.9131	250.4856	244.0029	230.2018	212.7805	196.4068	185.4683	182.8957	189.3785	203.1795	220.6009	236.9745	(68)

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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386	36.4386 (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)	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086	-107.5086 (71)
Water heating gains (Table 5)	117.1745	114.5930	109.6203	98.7215	92.0458	85.0679	80.7821	84.3231	88.4747	96.2174	106.6651	115.7810 (72)
Total internal gains	559.7771	573.5225	548.3127	527.8920	499.5157	477.4434	457.9399	458.9084	473.8218	494.0864	526.2346	547.4450 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
North				4.7000	10.6334	0.6300		0.7000		0.7700		15.2736 (74)	
South				6.5800	46.7521	0.6300		0.7000		0.7700		94.0153 (78)	
West				5.2900	19.6403	0.6300		0.7000		0.7700		31.7523 (80)	
Solar gains	141.0412	245.2756	348.0259	450.5307	521.1545	524.3591	502.6579	449.0980	383.4901	274.5231	169.8735	120.0822	(83)
Total gains	700.8183	818.7982	896.3386	978.4227	1020.6703	1001.8025	960.5978	908.0064	857.3119	768.6095	696.1081	667.5273	(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	35.9302	36.0180	36.1046	36.5166	36.5948	36.9630	36.9630	37.0320	36.8203	36.5948	36.4370	36.2736
alpha	3.3953	3.4012	3.4070	3.4344	3.4397	3.4642	3.4642	3.4688	3.4547	3.4397	3.4291	3.4182
util living area	0.9724	0.9534	0.9232	0.8570	0.7478	0.5891	0.4469	0.4873	0.6934	0.8819	0.9548	0.9763 (86)
MIT	19.1550	19.4418	19.8184	20.2936	20.6675	20.8957	20.9695	20.9586	20.8098	20.3214	19.6628	19.1084 (87)
Th 2	20.0010	20.0032	20.0053	20.0154	20.0173	20.0262	20.0262	20.0278	20.0228	20.0173	20.0135	20.0095 (88)
util rest of house	0.9673	0.9449	0.9090	0.8303	0.7008	0.5164	0.3552	0.3942	0.6256	0.8539	0.9451	0.9718 (89)
MIT 2	17.8579	18.2198	18.6913	19.2769	19.7091	19.9507	20.0112	20.0060	19.8718	19.3242	18.5098	17.8045 (90)
Living area fraction	FLA = Living area / (4) =											
MIT	18.1010	18.4489	18.9026	19.4675	19.8887	20.1279	20.1909	20.1846	20.0476	19.5111	18.7260	18.0489 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.1010	18.4489	18.9026	19.4675	19.8887	20.1279	20.1909	20.1846	20.0476	19.5111	18.7260	18.0489 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9536	0.9275	0.8893	0.8130	0.6941	0.5244	0.3712	0.4098	0.6275	0.8366	0.9283	0.9594 (94)
Useful gains	668.3309	759.4625	797.1490	795.4965	708.4191	525.3402	356.5552	372.1145	537.9883	642.9870	646.2162	640.3978 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1441.3648	1411.5797	1289.0536	1085.9304	839.6920	561.1932	364.5458	383.4985	606.1498	913.7660	1197.3125	1432.6759 (97)
Space heating kWh	575.1373	438.2228	365.9770	209.1124	97.6671	0.0000	0.0000	0.0000	0.0000	201.4596	396.7893	589.4549 (98a)
Space heating requirement - total per year (kWh/year)	2873.8203											
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	575.1373	438.2228	365.9770	209.1124	97.6671	0.0000	0.0000	0.0000	0.0000	201.4596	396.7893	589.4549 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2873.8203											
Space heating per m2	(98c) / (4) = 30.2635 (99)											

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (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	575.1373	438.2228	365.9770	209.1124	97.6671	0.0000	0.0000	0.0000	0.0000	201.4596	396.7893	589.4549 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	622.4429	474.2671	396.0790	226.3121	105.7003	0.0000	0.0000	0.0000	0.0000	218.0298	429.4256	637.9382 (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	243.1592	215.0063	228.5965	201.7201	195.9686	177.0731	175.2452	182.0173	183.7793	204.3131	216.4444	240.6277 (64)
Efficiency of water heater (217)m	86.1581	85.8729	85.3842	84.4587	82.9697	80.3000	80.3000	80.3000	80.3000	84.3513	85.6619	80.3000 (216)
Fuel for water heating, kWh/month	282.2245	250.3773	267.7270	238.8388	236.1930	220.5144	218.2381	226.6717	228.8659	242.2170	252.6730	279.0756 (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	26.6735	21.3985	19.2670	14.1158	10.9035	8.9082	9.9465	12.9288	16.7933	22.0337	24.8870	27.4149 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-43.6531	-61.1513	-87.3400	-97.5430	-104.6074	-97.4028	-96.1601	-91.0357	-81.9414	-69.5763	-47.8369	-37.7835 (233a)

Full SAP Calculation Printout



Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-25.8670	-54.2747	-107.6314	-161.3194	-213.0027	-213.9394	-211.4575	-179.2100	-131.5565	-77.5488	-34.5103	-20.4688	(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												3110.1951	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2943.6162	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												215.2708	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2346.8179	(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												4008.2641	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3110.1951	0.2100	653.1410	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2943.6162	0.2100	618.1594	(264)
Space and water heating			1271.3004	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	215.2708	0.1443	31.0702	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-916.0315	0.1347	-123.4189	
PV Unit electricity exported	-1430.7865	0.1260	-180.2126	
Total			-303.6315	(269)
Total CO2, kg/year			1010.6684	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.6400	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3110.1951	1.1300	3514.5205	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2943.6162	1.1300	3326.2863	(278)
Space and water heating			6840.8068	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	215.2708	1.5338	330.1895	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-916.0315	1.4980	-1372.1744	
PV Unit electricity exported	-1430.7865	0.4623	-661.5074	
Total			-2033.6818	(283)
Total Primary energy kWh/year			5267.4152	(286)
Target Primary Energy Rate (TPER)			55.4700	(287)

Predicted Energy Assessment



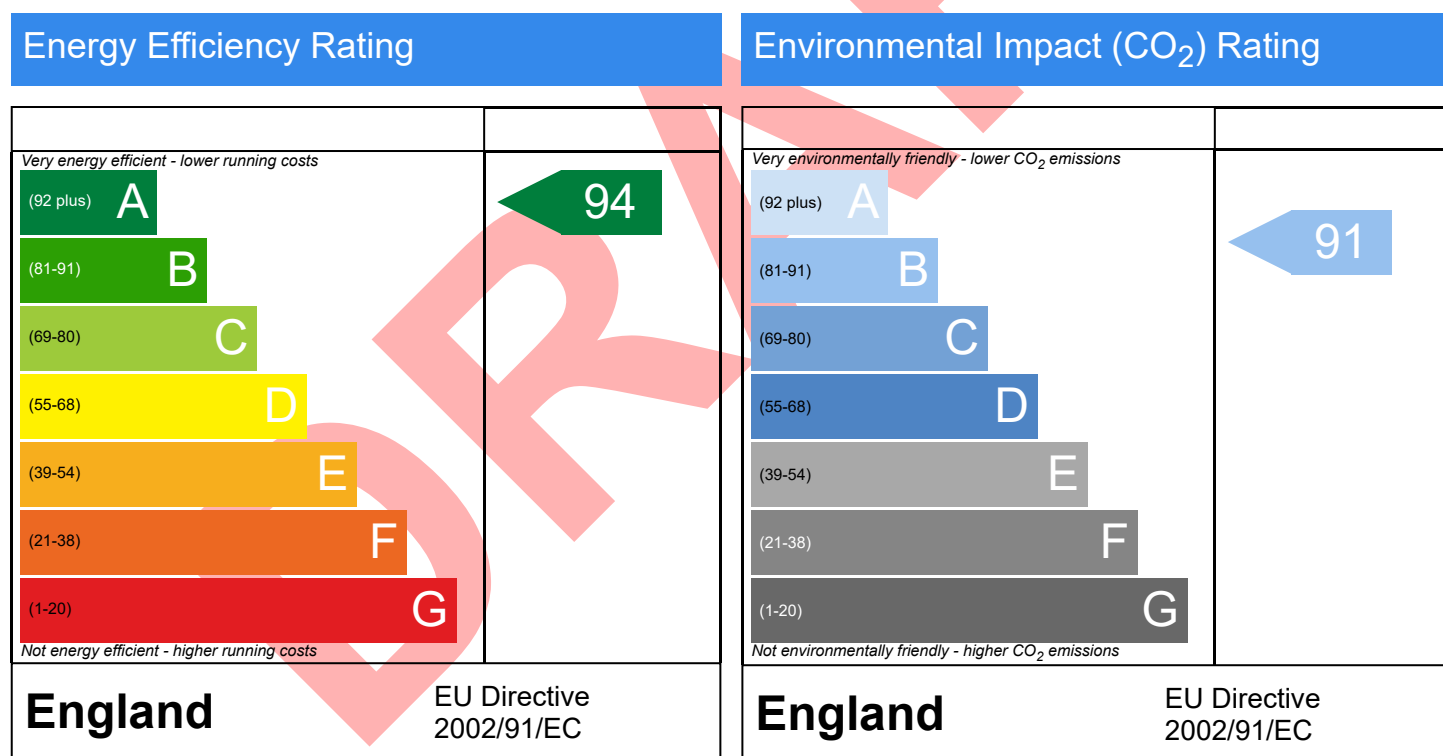
Highmoor Lane, CLECKHEATON, BD19 6LW

Dwelling type:
Date of assessment:
Produced by:
Total floor area:
DRRN:

House, Semi-Detached
07/05/2025
Paul Goddard
94.96 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

Energy Report



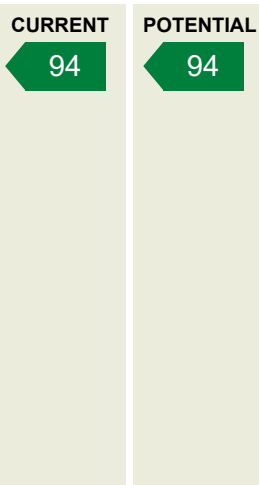
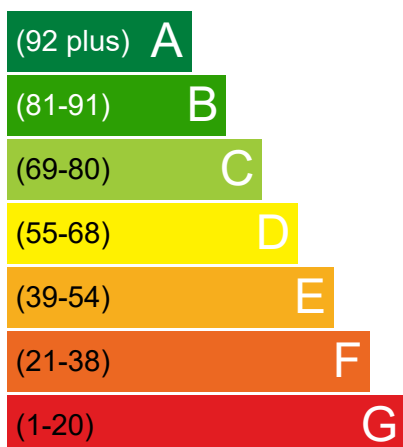
Dwelling Address	Highmoor Lane, CLECKHEATON, BD19 6LW
Reference	HT11-Semi-001
Assessment Date	07/05/2025
Submission Date	
Property Type	House, Semi-Detached
Total Floor Area	95

This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

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

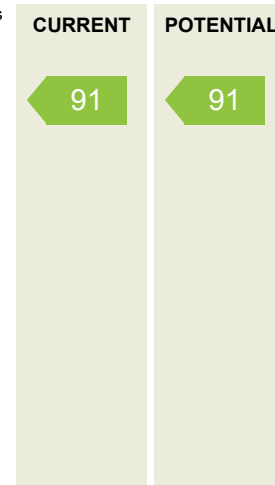
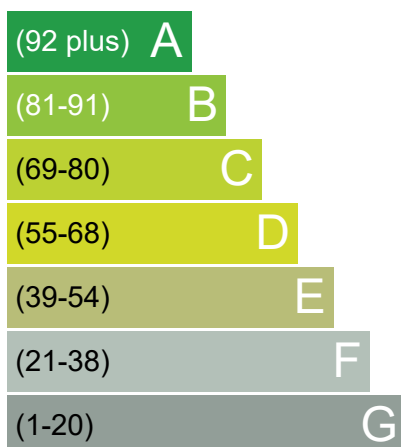
Energy Efficiency Rating

Most energy efficient - lower running costs

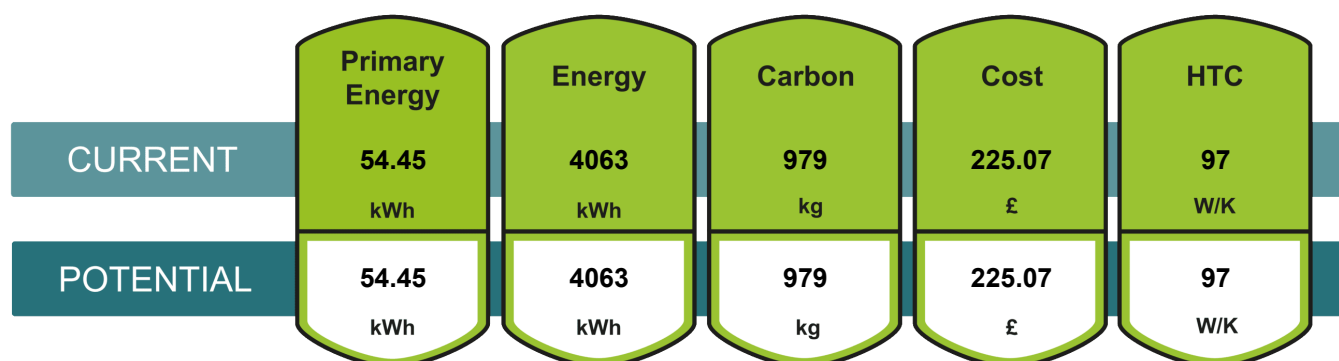


Carbon Dioxide (CO2) Emissions Rating

Very environmentally friendly - lower CO2 emissions



Additional ratings for your home



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 0.18 W/m ² K	Very Good
Roof	Average thermal transmittance 0.09 W/m ² K	Very Good
Floor	Average thermal transmittance 0.11 W/m ² K	Very Good
Windows	High performance glazing	Good
Main heating	Boiler and radiators, mains gas	Very Good
Main heating controls	Time and temperature zone control	Very Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 4.0 m ³ /h.m ² (assumed)	Good

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 measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating
Solar water heating	£19	A 94			A 92

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

		Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting		£72	£72	
Heating		£297	£297	
Hot Water		£150	£150	
New Technologies e.g. Impact of PV		-(£294)	-(£294)	
TOTAL		£225	£225	

Estimated energy use and potential savings



Space Heating

2852
kWh per year



Water Heating

2683
kWh per year

About this document

Created by:
Company/Trading name:
Phone number:
Email address:

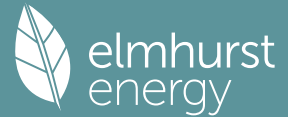
Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g. heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO ₂)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Full SAP Calculation Printout



Property Reference	HT12-Semi			Issued on Date	07/05/2025
Assessment Reference	001	Prop Type Ref			
Property	Highmoor Lane, CLECKHEATON, BD19 6LW				
SAP Rating	94 A	DER	10.40	TER	10.73
Environmental	91 B	% DER < TER			3.08
CO ₂ Emissions (t/year)	0.96	DFEE	34.62	TFEE	35.28
Compliance Check	See BREL	% DFEE < TFEE			1.86
% DPER < TPER	2.18	DPER	54.81	TPER	56.03
Assessor Details	Mr. Paul Goddard			Assessor ID	B342-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	47.1200 (1b)	x 2.5000 (2b)	= 117.8000 (1b) - (3b)
First floor	47.1200 (1c)	x 2.6000 (2c)	= 122.5120 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	240.3120 (5)

2. Ventilation rate

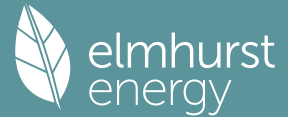
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.2000 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1700 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			2.1600	1.0000	2.1600		(26)
Window			8.7100	1.1450	9.9733		(27)
Patio Door			3.3300	1.3258	4.4148		(27)
GF			47.1200	0.1100	5.1832	9.0000	424.0800 (28a)
Main	100.7250	14.2000	86.5250	0.1800	15.5745	18.0000	1557.4500 (29a)
PIJ	47.1200		47.1200	0.0900	4.2408	9.0000	424.0800 (30)
Total net area of external elements Aum(A, m ²)			194.9650				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	41.5466	(33)
Main dwelling							
Party Wall 1			48.8500	0.0000	0.0000	20.0000	977.0000 (32)
Internal Wall 1			152.3200			75.0000	11424.0005 (32c)
Internal Floor 1			47.1200			18.0000	848.1600 (32d)
Internal Ceiling 1			47.1200			9.0000	424.0800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	16078.8505 (34)

Full SAP Calculation Printout



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

170.6160 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	9.8900	0.0500	0.4945
E2 Other lintels (including other steel lintels)	9.8900	0.0500	0.4945
E3 Sill	27.1600	0.0500	1.3580
E4 Jamb	19.7500	0.1000	1.9750
E5 Ground floor (normal)	19.7500	0.0700	1.3825
E6 Intermediate floor within a dwelling	10.1900	0.0900	0.9171
E16 Corner (normal)	10.1900	0.0600	0.6114
E18 Party wall between dwellings	9.5900	0.0800	0.7672
P1 Party wall - Ground floor	9.5900	0.1200	1.1508
P4 Party wall - Roof (insulation at ceiling level)	10.1600	0.0600	0.6096
E10 Eaves (insulation at ceiling level)	8.8000	0.0600	0.5280
E12 Gable (insulation at ceiling level)			

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

10.2886 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 51.8352 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	39.6515	39.6515	39.6515	39.6515	39.6515	39.6515	39.6515	39.6515	39.6515	39.6515	39.6515	39.6515
Heat transfer coeff	91.4866	91.4866	91.4866	91.4866	91.4866	91.4866	91.4866	91.4866	91.4866	91.4866	91.4866	91.4866
Average = Sum(39)m / 12 =												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9708	0.9708	0.9708	0.9708	0.9708	0.9708	0.9708	0.9708	0.9708	0.9708	0.9708	0.9708
HLP (average)												
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6794 (42)
Hot water usage for mixer showers	69.1449	68.1058	66.5916	63.6945	61.5565	59.1722	57.8170	59.3197	60.9670	63.5270	66.4863	68.8800	(42a)
Hot water usage for baths	29.8578	29.4144	28.7899	27.6386	26.7764	25.8205	25.3041	25.9242	26.5993	27.6223	28.7973	29.7569	(42b)
Hot water usage for other uses	42.0700	40.5402	39.0104	37.4805	35.9507	34.4209	34.4209	35.9507	37.4805	39.0104	40.5402	42.0700	(42c)
Average daily hot water use (litres/day)													129.6777 (43)
Daily hot water use	141.0727	138.0604	134.3919	128.8136	124.2837	119.4136	117.5420	121.1946	125.0469	130.1596	135.8238	140.7069	(44)
Energy conte	223.4247	196.5961	206.5554	176.3394	167.3097	146.8329	142.1569	150.0642	154.1953	176.6253	193.5060	220.3130	(45)
Energy content (annual)										Total = Sum(45)m =		2153.9189	
Distribution loss (46)m = 0.15 x (45)m	33.5137	29.4894	30.9833	26.4509	25.0965	22.0249	21.3235	22.5096	23.1293	26.4938	29.0259	33.0469	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	1.5649	1.4421	1.5985	1.4729	1.4808	1.3782	1.3636	1.3792	1.3518	1.4491	1.4670	1.5519	(61)
Total heat required for water heating calculated for each month	224.9896	198.0382	208.1539	177.8123	168.7905	148.2112	143.5205	151.4434	155.5471	178.0744	194.9730	221.8649	(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)
FV 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	224.9896	198.0382	208.1539	177.8123	168.7905	148.2112	143.5205	151.4434	155.5471	178.0744	194.9730	221.8649	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2171.4190	(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	74.6799	65.7287	69.0793	59.0011	56.0007	49.1665	47.6081	50.2412	51.6079	59.0902	64.7075	73.6420	(65)

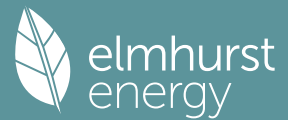
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	133.9713	133.9713	133.9713	133.9713	133.9713	133.9713	133.9713	133.9713	133.9713	133.9713	133.9713	133.9713	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	136.1903	150.7821	136.1903	140.7299	136.1903	140.7299	136.1903	136.1903	140.7299	136.1903	140.7299	136.1903	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	246.6658	249.2254	242.7752	229.0436	211.7099	195.4187	184.5351	181.9755	188.4256	202.1573	219.4910	235.7822	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3971	36.3971	36.3971	36.3971	36.3971	36.3971	36.3971	36.3971	36.3971	36.3971	36.3971	36.3971	(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)	-107.1770	-107.1770	-107.1770	-107.1770	-107.1770	-107.1770	-107.1770	-107.1770	-107.1770	-107.1770	-107.1770	-107.1770	(71)
Water heating gains (Table 5)	100.3763	97.8106	92.8485	81.9459	75.2697	68.2868	63.9893	67.5284	71.6776	79.4223	89.8715	98.9812	(72)
Total internal gains	549.4237	564.0094	538.0054	517.9108	489.3613	467.6268	447.9061	448.8856	464.0246	483.9612	516.2838	537.1451	(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
Southeast	4.2700	36.7938	0.3300	0.0000	0.7700	39.9216 (77)
Southwest	1.2100	36.7938	0.3300	0.0000	0.7700	11.3127 (79)
Northwest	3.2300	11.2829	0.3300	0.0000	0.7700	9.2604 (81)
Northwest	3.3300	11.2829	0.6300	0.7000	0.7700	11.4826 (81)

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Solar gains	71.9772	129.4937	195.4800	272.8844	333.6522	343.5552	326.0986	278.8802	221.9885	148.0526	87.4668	60.7856 (83)
Total gains	621.4008	693.5032	733.4853	790.7952	823.0135	811.1820	774.0047	727.7658	686.0131	632.0138	603.7506	597.9306 (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	48.8197	48.8197	48.8197	48.8197	48.8197	48.8197	48.8197	48.8197	48.8197	48.8197	48.8197	48.8197	
alpha	4.2546	4.2546	4.2546	4.2546	4.2546	4.2546	4.2546	4.2546	4.2546	4.2546	4.2546	4.2546	
util living area	0.9870	0.9781	0.9624	0.9177	0.8229	0.6606	0.5041	0.5531	0.7746	0.9333	0.9775	0.9889 (86)	
MIT	19.5478	19.7382	20.0144	20.3945	20.7244	20.9212	20.9804	20.9710	20.8414	20.4258	19.9178	19.4983 (87)	
Th 2	20.1078	20.1078	20.1078	20.1078	20.1078	20.1078	20.1078	20.1078	20.1078	20.1078	20.1078	20.1078 (88)	
util rest of house	0.9841	0.9734	0.9539	0.8983	0.7814	0.5874	0.4088	0.4562	0.7110	0.9136	0.9717	0.9865 (89)	
MIT 2	18.4070	18.6483	18.9967	19.4659	19.8507	20.0519	20.0986	20.0931	19.9817	19.5119	18.8784	18.3442 (90)	
Living area fraction	fLA = Living area / (4) =												0.1443 (91)
MIT	18.5717	18.8056	19.1436	19.5999	19.9768	20.1773	20.2259	20.2198	20.1058	19.6438	19.0284	18.5108 (92)	
Temperature adjustment													-0.1500
adjusted MIT	18.4217	18.6556	18.9936	19.4499	19.8268	20.0273	20.0759	20.0698	19.9558	19.4938	18.8784	18.3608 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9764	0.9628	0.9399	0.8808	0.7665	0.5803	0.4053	0.4519	0.6988	0.8963	0.9607	0.9796 (94)
Useful gains	606.7621	667.7067	689.3941	696.5029	630.8020	470.7097	313.6996	328.8957	479.3723	566.4756	580.0469	585.7222 (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	1291.9440	1258.4513	1142.9941	965.1730	743.4959	496.5278	317.9956	335.7400	535.7257	813.6656	1077.5632	1295.5205 (97)
Space heating kWh	509.7753	396.9804	337.4784	193.4425	83.8442	0.0000	0.0000	0.0000	0.0000	183.9093	358.2118	528.0899 (98a)
Space heating requirement - total per year (kWh/year)												2591.7318
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	509.7753	396.9804	337.4784	193.4425	83.8442	0.0000	0.0000	0.0000	0.0000	183.9093	358.2118	528.0899 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2591.7318
Space heating per m2											(98c) / (4) =	27.5014 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												88.7000 (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	509.7753	396.9804	337.4784	193.4425	83.8442	0.0000	0.0000	0.0000	0.0000	183.9093	358.2118	528.0899 (98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)
Space heating fuel (main heating system)	574.7185	447.5540	380.4717	218.0862	94.5256	0.0000	0.0000	0.0000	0.0000	207.3386	403.8464	595.3663 (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	224.9896	198.0382	208.1539	177.8123	168.7905	148.2112	143.5205	151.4434	155.5471	178.0744	194.9730	221.8649 (64)
Efficiency of water heater	84.4576	84.1079	83.4760	82.2387	79.9387	76.2000	76.2000	76.2000	76.2000	82.0765	83.8519	76.2000 (216)
Fuel for water heating, kWh/month	266.3934	235.4573	249.3577	216.2149	211.1499	194.5029	188.3471	198.7447	204.1300	216.9615	232.5207	262.2683 (217)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	11.3002	10.2066	11.3002	10.9357	11.3002	10.9357	11.3002	11.3002	10.9357	11.3002	10.9357	11.3002 (231)
Lighting	31.9660	25.6444	23.0899	16.9166	13.0669	10.6758	11.9201	15.4942	20.1254	26.4056	29.8250	32.8545 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-37.6797	-53.7202	-78.0480	-88.7036	-96.4372	-90.2980	-89.2346	-83.9213	-74.5724	-61.9463	-41.6592	-32.5104 (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	-19.4240	-41.0906	-82.1012	-123.9256	-164.4473	-165.4379	-163.4420	-138.0581	-100.7944	-58.9021	-25.9807	-15.3379 (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												2921.9074 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												76.2000
Water heating fuel used												2676.0483 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:
(MEVDcentralised, Database: total watage = 4.6540, total flow = 29.0000, SFP = 0.1605)

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mechanical ventilation fans (SFP = 0.1605)	47.0504 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	133.0504 (231)
Electricity for lighting (calculated in Appendix L)	257.9843 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1927.6727 (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	4061.3177 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2921.9074	0.2100	613.6005 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2676.0483	0.2100	561.9701 (264)
Space and water heating			1175.5707 (265)
Pumps, fans and electric keep-hot	133.0504	0.1432	18.8440 (267)
Energy for lighting	257.9843	0.1490	38.4448 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-828.7309	0.1387	-114.9441
PV Unit electricity exported	-1098.9418	0.1258	-138.1970
Total			-253.1411 (269)
Total CO2, kg/year			979.7183 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.4000 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2921.9074	1.1300	3301.7553 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2676.0483	1.1300	3023.9346 (278)
Space and water heating			6325.6899 (279)
Pumps, fans and electric keep-hot	133.0504	1.5335	203.0649 (281)
Energy for lighting	257.9843	1.5547	401.0997 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-828.7309	1.5170	-1257.2220
PV Unit electricity exported	-1098.9418	0.4616	-507.2710
Total			-1764.4930 (283)
Total Primary energy kWh/year			5165.3616 (286)
Dwelling Primary energy Rate (DPER)			54.8100 (287)

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

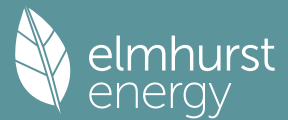
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	47.1200 (1b)	x 2.5000 (2b)	= 117.8000 (1b) - (3b)
First floor	47.1200 (1c)	x 2.6000 (2c)	= 122.5120 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	240.3120 (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) = 0.1248 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3748 (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) = 0.3186 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
Effective ac	0.4062	0.3983	0.3903	0.3505	0.3425	0.3027	0.3027	0.2947	0.3186	0.3425	0.3584	0.3744	(22b)
	0.5825	0.5793	0.5762	0.5614	0.5587	0.5458	0.5458	0.5434	0.5508	0.5587	0.5642	0.5701	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.1600	1.0000	2.1600		(26)
TER Opening Type			12.0400	1.1450	13.7863		(27)
GF			47.1200	0.1300	6.1256		(28a)
Main	100.7250	14.2000	86.5250	0.1800	15.5745		(29a)
PIJ	47.1200		47.1200	0.1100	5.1832		(30)
Total net area of external elements Aum(A, m2)			194.9650				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	42.8296	(33)
Main dwelling							
Party Wall 1			48.8500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							170.6160 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.8900	0.0500	0.4945
E3 Sill	9.8900	0.0500	0.4945
E4 Jamb	27.1600	0.0500	1.3580
E5 Ground floor (normal)	19.7500	0.1600	3.1600
E6 Intermediate floor within a dwelling	19.7500	0.0000	0.0000
E16 Corner (normal)	10.1900	0.0900	0.9171
E18 Party wall between dwellings	10.1900	0.0600	0.6114
P1 Party wall - Ground floor	9.5900	0.0800	0.7672
P4 Party wall - Roof (insulation at ceiling level)	9.5900	0.1200	1.1508
E10 Eaves (insulation at ceiling level)	10.1600	0.0600	0.6096
E12 Gable (insulation at ceiling level)	8.8000	0.0600	0.5280
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			10.0911 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 52.9207 (37)

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

(38)m	Jan 46.1949	Feb 45.9408	Mar 45.6917	Apr 44.5219	May 44.3031	Jun 43.2842	Jul 43.2842	Aug 43.0955	Sep 43.6766	Oct 44.3031	Nov 44.7458	Dec 45.2087	(38)
Heat transfer coeff	99.1155	98.8615	98.6124	97.4426	97.2237	96.2048	96.2048	96.0162	96.5973	97.2237	97.6665	98.1294	(39)
Average = Sum(39)m / 12 =												97.4415	
HLP	Jan 1.0517	Feb 1.0490	Mar 1.0464	Apr 1.0340	May 1.0317	Jun 1.0208	Jul 1.0208	Aug 1.0188	Sep 1.0250	Oct 1.0317	Nov 1.0364	Dec 1.0413	(40)
HLP (average)												1.0340	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

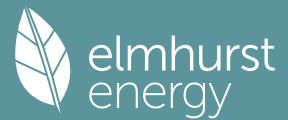
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6794 (42)
Hot water usage for mixer showers													
69.1449	68.1058	66.5916	63.6945	61.5565	59.1722	57.8170	59.3197	60.9670	63.5270	66.4863	68.8800	(42a)	
Hot water usage for baths													
29.8578	29.4144	28.7899	27.6386	26.7764	25.8205	25.3041	25.9242	26.5993	27.6223	28.7973	29.7569	(42b)	
Hot water usage for other uses													
42.0700	40.5402	39.0104	37.4805	35.9507	34.4209	34.4209	35.9507	37.4805	39.0104	40.5402	42.0700	(42c)	
Average daily hot water use (litres/day)													129.6777 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
141.0727	138.0604	134.3919	128.8136	124.2837	119.4136	117.5420	121.1946	125.0469	130.1596	135.8238	140.7069	(44)	
Energy content (annual)	223.4247	196.5961	206.5554	176.3394	167.3097	146.8329	142.1569	150.0642	154.1953	176.6253	193.5060	220.3130	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2153.9189	
33.5137	29.4894	30.9833	26.4509	25.0965	22.0249	21.3235	22.5096	23.1293	26.4938	29.0259	33.0469	(46)	
Water storage loss:													
Total storage loss													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
274.3836	242.6235	257.5143	225.6545	218.2686	196.1480	193.1158	201.0232	203.5103	227.5842	242.8210	271.2719	(62)	
WWHRS	-31.6102	-27.9563	-29.2742	-24.2402	-22.5910	-19.3313	-18.1200	-19.2688	-20.0009	-23.5788	-26.7120	-31.0248	(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	242.7735	214.6672	228.2401	201.4142	195.6776	176.8167	174.9958	181.7544	183.5095	204.0054	216.1091	240.2471	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2460.2104	(64)
Electric shower(s)												2460	(64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Heat gains from water heating, kWh/month													
87.0284	76.8751	81.4194	70.9616	68.3702	61.1507	60.0069	62.6361	63.5987	71.4676	76.6695	85.9938	(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	133.9713	133.9713	133.9713	133.9713	133.9713	133.9713	133.9713	133.9713	133.9713	133.9713	133.9713	133.9713	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	136.1903	150.7821	136.1903	140.7299	136.1903	140.7299	136.1903	136.1903	140.7299	136.1903	140.7299	136.1903	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	246.6658	249.2254	242.7752	229.0436	211.7099	195.4187	184.5351	181.9755	188.4256	202.1573	219.4910	235.7822	(68)

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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
Pumps, fans	36.3971	36.3971	36.3971	36.3971	36.3971	36.3971	36.3971	36.3971	36.3971	36.3971	36.3971	36.3971 (69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)	-107.1770	-107.1770	-107.1770	-107.1770	-107.1770	-107.1770	-107.1770	-107.1770	-107.1770	-107.1770	-107.1770	-107.1770 (71)
Total internal gains	116.9737	114.3974	109.4347	98.5578	91.8954	84.9316	80.6544	84.1883	88.3315	96.0587	106.4854	115.5830 (72)
	566.0211	580.5962	554.5915	534.5227	505.9870	484.2715	464.5712	465.5454	480.6785	500.5976	532.8977	553.7469 (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
Southeast				4.2700	36.7938		0.6300		0.7000		0.7700	48.0148 (77)
Southwest				1.2100	36.7938		0.6300		0.7000		0.7700	13.6061 (79)
Northwest				6.5600	11.2829		0.6300		0.7000		0.7700	22.6203 (81)

Solar gains	84.2411	151.0073	226.5721	314.1853	382.4467	393.1115	373.4123	320.4329	256.5892	172.2762	102.2697	71.2074 (83)
Total gains	650.2622	731.6035	781.1636	848.7080	888.4337	877.3830	837.9834	785.9784	737.2676	672.8738	635.1674	624.9543 (84)

7. Mean internal temperature (heating season)												

Temperature during heating periods in the living area from Table 9, Th1 (C)												
Utilisation factor for gains for living area, nil,m (see Table 9a)												21.0000 (85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	45.0620	45.1778	45.2919	45.8357	45.9389	46.4254	46.4254	46.5166	46.2368	45.9389	45.7306	45.5149
alpha	4.0041	4.0119	4.0195	4.0557	4.0626	4.0950	4.0950	4.1011	4.0825	4.0626	4.0487	4.0343
util living area	0.9855	0.9756	0.9580	0.9089	0.8095	0.6430	0.4894	0.5375	0.7608	0.9267	0.9749	0.9875 (86)
MIT	19.4216	19.6331	19.9382	20.3628	20.7107	20.9192	20.9793	20.9699	20.8346	20.3940	19.8468	19.3910 (87)
Th 2	20.0404	20.0427	20.0448	20.0551	20.0570	20.0660	20.0660	20.0677	20.0625	20.0570	20.0531	20.0491 (88)
util rest of house	0.9822	0.9703	0.9484	0.8874	0.7651	0.5675	0.3924	0.4387	0.6940	0.9050	0.9684	0.9847 (89)
MIT 2	18.2008	18.4700	18.8557	19.3857	19.7906	20.0098	20.0566	20.0529	19.9332	19.4340	18.7505	18.1677 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	18.3770	18.6378	19.0120	19.5267	19.9234	20.1410	20.1898	20.1852	20.0633	19.5726	18.9087	18.3443 (92)
Temperature adjustment												0.0000
adjusted MIT	18.3770	18.6378	19.0120	19.5267	19.9234	20.1410	20.1898	20.1852	20.0633	19.5726	18.9087	18.3443 (93)

8. Space heating requirement												

Utilisation	0.9743	0.9596	0.9350	0.8731	0.7581	0.5739	0.4056	0.4517	0.6940	0.8911	0.9578	0.9776 (94)
Useful gains	633.5673	702.0627	730.4061	740.9725	673.4809	503.5524	339.9117	355.0135	511.6800	599.6052	608.3475	610.9626 (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	1395.2506	1358.1433	1233.8341	1035.4921	799.5099	533.0704	345.3549	363.4408	576.0401	872.3451	1153.3124	1387.9693 (97)
Space heating kWh	566.6924	440.8862	374.5504	212.0541	93.7656	0.0000	0.0000	0.0000	0.0000	202.9184	392.3747	578.0930 (98a)
Space heating requirement - total per year (kWh/year)												2861.3349
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	566.6924	440.8862	374.5504	212.0541	93.7656	0.0000	0.0000	0.0000	0.0000	202.9184	392.3747	578.0930 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2861.3349
Space heating per m2										(98c) / (4) =		30.3622 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (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	566.6924	440.8862	374.5504	212.0541	93.7656	0.0000	0.0000	0.0000	0.0000	202.9184	392.3747	578.0930 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	613.3035	477.1496	405.3576	229.4958	101.4779	0.0000	0.0000	0.0000	0.0000	219.6087	424.6479	625.6418 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	242.7735	214.6672	228.2401	201.4142	195.6776	176.8167	174.9958	181.7544	183.5095	204.0054	216.1091	240.2471 (64)
Efficiency of water heater (217)m	86.1333	85.8879	85.4355	84.4920	82.8979	80.3000	80.3000	80.3000	80.3000	84.3700	85.6424	80.3000 (216)
Fuel for water heating, kWh/month	281.8577	249.9389	267.1491	238.3828	236.0465	220.1952	217.9275	226.3441	228.5298	241.7985	252.3388	278.7411 (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	28.2976	22.7014	20.4401	14.9753	11.5674	9.4506	10.5521	13.7161	17.8158	23.3753	26.4023	29.0841 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-43.4073	-60.8389	-86.9248	-97.1026	-104.1449	-96.9746	-95.7568	-90.6749	-81.6196	-69.2678	-47.5883	-37.5686 (233)

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Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-25.5857	-53.7120	-106.5684	-159.7970	-211.0570	-212.0068	-209.5284	-177.5218	-130.2595	-76.7418	-34.1346	-20.2420	(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												3096.6828	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2939.2501	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												228.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2329.0240	(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												4021.2871	(238)

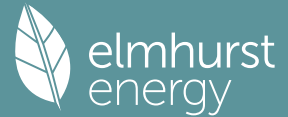
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3096.6828	0.2100	650.3034 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2939.2501	0.2100	617.2425 (264)
Space and water heating			1267.5459 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	228.3782	0.1443	32.9620 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-911.8691	0.1347	-122.8510
PV Unit electricity exported	-1417.1549	0.1259	-178.4790
Total			-301.3300 (269)
Total CO2, kg/year			1011.1072 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.7300 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3096.6828	1.1300	3499.2516 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2939.2501	1.1300	3321.3526 (278)
Space and water heating			6820.6042 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	228.3782	1.5338	350.2941 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-911.8691	1.4979	-1365.9126
PV Unit electricity exported	-1417.1549	0.4623	-655.1433
Total			-2021.0560 (283)
Total Primary energy kWh/year			5279.9431 (286)
Target Primary Energy Rate (TPER)			56.0300 (287)

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Property Reference	HT12-Semi			Issued on Date	07/05/2025
Assessment Reference	001	Prop Type Ref			
Property	Highmoor Lane, CLECKHEATON, BD19 6LW				
SAP Rating	94 A	DER	10.40	TER	10.73
Environmental	91 B	% DER < TER			3.08
CO ₂ Emissions (t/year)	0.96	DFEE	34.62	TFEE	35.28
Compliance Check	See BREL	% DFEE < TFEE			1.86
% DPER < TPER	2.18	DPER	54.81	TPER	56.03
Assessor Details	Mr. Paul Goddard			Assessor ID	B342-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	47.1200 (1b)	x 2.5000 (2b)	= 117.8000 (1b) - (3b)
First floor	47.1200 (1c)	x 2.6000 (2c)	= 122.5120 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 240.3120 (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) = 0.1248 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3248 (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) = 0.2761 (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	0.3520	0.3451	0.3382	0.3037	0.2968	0.2623	0.2623	0.2554	0.2761	0.2968	0.3106	0.3244 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5620	0.5596	0.5572	0.5461	0.5441	0.5344	0.5344	0.5326	0.5381	0.5441	0.5482	0.5526 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			2.1600	1.0000	2.1600		(26)
Window			8.7100	1.1450	9.9733		(27)
Patio Door			3.3300	1.3258	4.4148		(27)
GF			47.1200	0.1100	5.1832	9.0000	424.0800 (28a)
Main	100.7250	14.2000	86.5250	0.1800	15.5745	18.0000	1557.4500 (29a)
PIJ	47.1200		47.1200	0.0900	4.2408	9.0000	424.0800 (30)
Total net area of external elements Aum(A, m ²)			194.9650				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	41.5466	(33)
Main dwelling							
Party Wall 1			48.8500	0.0000	0.0000	20.0000	977.0000 (32)
Internal Wall 1			152.3200			75.0000	11424.0005 (32c)
Internal Floor 1			47.1200			18.0000	848.1600 (32d)
Internal Ceiling 1			47.1200			9.0000	424.0800 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 16078.8505 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							170.6160 (35)
List of Thermal Bridges							

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Total gains 569.1678 642.5476 685.5034 750.0111 786.4621 782.1056 747.9945 699.7197 655.5081 593.5204 558.3891 546.6777 (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	46.3310	46.4229	46.5133	46.9428	47.0241	47.4060	47.4060	47.4774	47.2581	47.0241	46.8600	46.6897
alpha	4.0887	4.0949	4.1009	4.1295	4.1349	4.1604	4.1604	4.1652	4.1505	4.1349	4.1240	4.1126
util living area	0.9907	0.9839	0.9715	0.9332	0.8490	0.6900	0.5319	0.5836	0.8037	0.9476	0.9834	0.9921 (86)
MIT	19.3608	19.5625	19.8605	20.2903	20.6608	20.9001	20.9738	20.9616	20.8027	20.3308	19.7808	19.3281 (87)
Th 2	20.0643	20.0659	20.0676	20.0753	20.0768	20.0836	20.0836	20.0848	20.0810	20.0768	20.0739	20.0708 (88)
util rest of house	0.9886	0.9802	0.9646	0.9163	0.8099	0.6153	0.4307	0.4816	0.7420	0.9310	0.9790	0.9904 (89)
MIT 2	18.5645	18.7657	19.0612	19.4841	19.8272	20.0277	20.0740	20.0696	19.9568	19.5301	18.9895	18.5370 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.6794	18.8807	19.1765	19.6004	19.9475	20.1536	20.2038	20.1983	20.0788	19.6456	19.1037	18.6512 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.6794	18.8807	19.1765	19.6004	19.9475	20.1536	20.2038	20.1983	20.0788	19.6456	19.1037	18.6512 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9844	0.9740	0.9562	0.9058	0.8037	0.6214	0.4445	0.4950	0.7419	0.9212	0.9727	0.9866 (94)
Useful gains	560.2608	625.8672	655.4726	679.3690	632.0433	486.0344	332.4799	346.3387	486.3019	546.7637	543.1640	539.3332 (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	1386.1889	1345.0810	1217.2373	1018.0857	783.3459	523.2354	339.5349	357.3216	565.0574	859.1547	1144.1029	1382.3999 (97)
Space heating kWh	614.4905	483.3116	417.9529	243.8760	112.5691	0.0000	0.0000	0.0000	0.0000	232.4189	432.6760	627.2416 (98a)
Space heating requirement - total per year (kWh/year)	3164.5367											
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	0.0000											
Space heating kWh	614.4905	483.3116	417.9529	243.8760	112.5691	0.0000	0.0000	0.0000	0.0000	232.4189	432.6760	627.2416 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	3164.5367											
Space heating per m2	(98c) / (4) = 33.5795 (99)											

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan 4.3000	Feb 4.9000	Mar 6.5000	Apr 8.9000	May 11.7000	Jun 14.6000	Jul 16.6000	Aug 16.4000	Sep 14.1000	Oct 10.6000	Nov 7.1000	Dec 4.2000
Heat loss rate W												
	0.0000	0.0000	0.0000	0.0000	0.0000	885.6195	697.1898	714.9559	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7902	0.8634	0.8308	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	699.7794	601.9853	593.9600	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	851.6987	814.7792	761.1324	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000										
			0.0000	0.0000	0.0000	109.3819	158.3186	124.3762	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	27.3455	39.5797	31.0941	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												98.0192 (107)
Energy for space heating												33.5795 (99)
Energy for space cooling												1.0401 (108)
Total												34.6197 (109)
Fabric Energy Efficiency (DFEE)												34.6 (109)

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

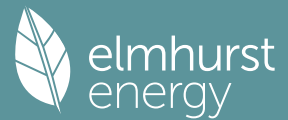
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	47.1200 (1b)	x 2.5000 (2b)	= 117.8000 (1b) - (3b)
First floor	47.1200 (1c)	x 2.6000 (2c)	= 122.5120 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 240.3120 (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)

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Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1248 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3748	(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) =	0.3186 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000	(22)
Wind factor	Jan 1.2750 Feb 1.2500 Mar 1.2250 Apr 1.1000 May 1.0750 Jun 0.9500 Jul 0.9500 Aug 0.9250 Sep 1.0000 Oct 1.0750 Nov 1.1250 Dec 1.1750	(22a)
Adj infilt rate	Jan 0.4062 Feb 0.3983 Mar 0.3903 Apr 0.3505 May 0.3425 Jun 0.3027 Jul 0.3027 Aug 0.2947 Sep 0.3186 Oct 0.3425 Nov 0.3584 Dec 0.3744	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		0.0000 (23c)
Effective ac	Jan 0.5825 Feb 0.5793 Mar 0.5762 Apr 0.5614 May 0.5587 Jun 0.5458 Jul 0.5458 Aug 0.5434 Sep 0.5508 Oct 0.5587 Nov 0.5642 Dec 0.5701	(25)

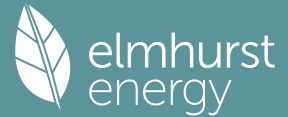
3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.1600	1.0000	2.1600		(26)
TER Opening Type			12.0400	1.1450	13.7863		(27)
GF			47.1200	0.1300	6.1256		(28a)
Main	100.7250	14.2000	86.5250	0.1800	15.5745		(29a)
PIJ	47.1200		47.1200	0.1100	5.1832		(30)
Total net area of external elements Aum (A, m2)			194.9650				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	42.8296	(33)
Main dwelling							
Party Wall 1			48.8500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							170.6160 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				9.8900	0.0500	0.4945	
E3 Sill				9.8900	0.0500	0.4945	
E4 Jamb				27.1600	0.0500	1.3580	
E5 Ground floor (normal)				19.7500	0.1600	3.1600	
E6 Intermediate floor within a dwelling				19.7500	0.0000	0.0000	
E16 Corner (normal)				10.1900	0.0900	0.9171	
E18 Party wall between dwellings				10.1900	0.0600	0.6114	
P1 Party wall - Ground floor				9.5900	0.0800	0.7672	
P4 Party wall - Roof (insulation at ceiling level)				9.5900	0.1200	1.1508	
E10 Eaves (insulation at ceiling level)				10.1600	0.0600	0.6096	
E12 Gable (insulation at ceiling level)				8.8000	0.0600	0.5280	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.0911 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	52.9207 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	Jan 46.1949 Feb 45.9408 Mar 45.6917 Apr 44.5219 May 44.3031 Jun 43.2842 Jul 43.2842 Aug 43.0955 Sep 43.6766 Oct 44.3031 Nov 44.7458 Dec 45.2087						(38)
Heat transfer coeff	Jan 99.1155 Feb 98.8615 Mar 98.6124 Apr 97.4426 May 97.2237 Jun 96.2048 Jul 96.2048 Aug 96.0162 Sep 96.5973 Oct 97.2237 Nov 97.6665 Dec 98.1294						(39)
Average = Sum(39)m / 12 =							97.4415
HLP	Jan 1.0517 Feb 1.0490 Mar 1.0464 Apr 1.0340 May 1.0317 Jun 1.0208 Jul 1.0208 Aug 1.0188 Sep 1.0250 Oct 1.0317 Nov 1.0364 Dec 1.0413						(40)
HLP (average)							1.0340
Days in mont	31 28 31 30 31 30 31 31 30 31 30 31						

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6794 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths												29.8578 29.4144 28.7899 27.6386 26.7764 25.8205 25.3041 25.9242 26.5993 27.6223 28.7973 29.7569 (42b)
Hot water usage for other uses												42.0700 40.5402 39.0104 37.4805 35.9507 34.4209 34.4209 35.9507 37.4805 39.0104 40.5402 42.0700 (42c)
Average daily hot water use (litres/day)												65.9283 (43)
Daily hot water use	Jan 71.9278 Feb 69.9546 Mar 67.8003 Apr 65.1191 May 62.7272 Jun 60.2414 Jul 59.7250 Aug 61.8749 Sep 64.0799 Oct 66.6326 Nov 69.3375 Dec 71.8269 (44)											
Energy conte	113.9161 99.6144 104.2065 89.1448 84.4428 74.0738 72.2323 76.6141 79.0169 90.4198 98.7840 112.4635 (45)											
Energy content (annual)												1094.9290
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:												
Total storage loss	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (46)											
If cylinder contains dedicated solar storage												
Primary loss	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (57)											
Combi loss	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (59)											
Total heat required for water heating calculated for each month												
WWHRS	96.8287 84.6722 88.5756 75.7731 71.7764 62.9628 61.3974 65.1220 67.1644 76.8569 83.9664 95.5940 (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	96.8287 84.6722 88.5756 75.7731 71.7764 62.9628 61.3974 65.1220 67.1644 76.8569 83.9664 95.5940 (64)											
Total per year (kWh/year) = Sum(64)m =												930.6897 (64)
12Total per year (kWh/year)												931 (64)

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Electric shower(s)	55.3736	49.3383	53.8755	51.4128	52.3775	49.9631	51.6285	52.3775	51.4128	53.8755	52.8625	55.3736 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												629.8711 (64a)
Heat gains from water heating, kWh/month	38.0506	33.5026	35.6128	31.7965	31.0385	28.2315	28.2565	29.3749	29.6443	32.6831	34.2072	37.7419 (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	133.9713	133.9713	133.9713	133.9713	133.9713	133.9713	133.9713	133.9713	133.9713	133.9713	133.9713	133.9713	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	136.1903	150.7821	136.1903	140.7299	136.1903	140.7299	136.1903	136.1903	140.7299	136.1903	140.7299	136.1903	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	246.6658	249.2254	242.7752	229.0436	211.7099	195.4187	184.5351	181.9755	188.4256	202.1573	219.4910	235.7822	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3971	36.3971	36.3971	36.3971	36.3971	36.3971	36.3971	36.3971	36.3971	36.3971	36.3971	36.3971	(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)	-107.1770	-107.1770	-107.1770	-107.1770	-107.1770	-107.1770	-107.1770	-107.1770	-107.1770	-107.1770	-107.1770	-107.1770	(71)
Water heating gains (Table 5)	51.1432	49.8551	47.8666	44.1618	41.7184	39.2104	37.9791	39.4824	41.1726	43.9289	47.5100	50.7283	(72)
Total internal gains	497.1906	513.0539	490.0235	477.1267	452.8099	438.5503	421.8959	420.8395	433.5196	445.4678	470.9223	485.8922	(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	
Southeast				4.2700	36.7938	0.6300	0.7000	0.7700			48.0148 (77)	
Southwest				1.2100	36.7938	0.6300	0.7000	0.7700			13.6061 (79)	
Northwest				6.5600	11.2829	0.6300	0.7000	0.7700			22.6203 (81)	
Solar gains	84.2411	151.0073	226.5721	314.1853	382.4467	393.1115	373.4123	320.4329	256.5892	172.2762	102.2697	71.2074 (83)
Total gains	581.4317	664.0612	716.5956	791.3120	835.2566	831.6618	795.3082	741.2724	690.1087	617.7440	573.1920	557.0996 (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	45.0620	45.1778	45.2919	45.8357	45.9389	46.4254	46.4254	46.5166	46.2368	45.9389	45.7306	45.5149	
alpha	4.0041	4.0119	4.0195	4.0557	4.0626	4.0950	4.0950	4.1011	4.0825	4.0626	4.0487	4.0343	
util living area	0.9901	0.9823	0.9680	0.9247	0.8329	0.6687	0.5126	0.5648	0.7890	0.9427	0.9822	0.9916	(86)
MIT	19.3203	19.5375	19.8529	20.3009	20.6740	20.9066	20.9756	20.9639	20.8089	20.3295	19.7589	19.2901	(87)
Th 2	20.0404	20.0427	20.0448	20.0551	20.0570	20.0660	20.0660	20.0677	20.0625	20.0570	20.0531	20.0491	(88)
util rest of house	0.9879	0.9783	0.9603	0.9061	0.7912	0.5929	0.4123	0.4630	0.7248	0.9247	0.9774	0.9897	(89)
MIT 2	18.5067	18.7233	19.0360	19.4769	19.8199	20.0146	20.0573	20.0536	19.9439	19.5125	18.9523	18.4831	(90)
Living area fraction	18.6241	18.8408	19.1539	19.5958	19.9432	20.1434	20.1898	20.1850	20.0687	19.6304	19.0687	18.5995	(91)
MIT	18.6241	18.8408	19.1539	19.5958	19.9432	20.1434	20.1898	20.1850	20.0687	19.6304	19.0687	18.5995	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6241	18.8408	19.1539	19.5958	19.9432	20.1434	20.1898	20.1850	20.0687	19.6304	19.0687	18.5995	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9833	0.9716	0.9512	0.8952	0.7855	0.5996	0.4261	0.4765	0.7253	0.9145	0.9707	0.9857	(94)
Ext temp.	571.6984	645.1891	681.6100	708.3572	656.1336	498.6891	338.8430	353.1941	500.5297	564.9394	556.4199	549.1287	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Space heating kWh	1419.7432	1378.2103	1247.8319	1042.2257	801.4345	533.2979	345.3537	363.4220	576.5607	877.9730	1168.9375	1413.0161	(97)
Space heating requirement - total per year (kWh/year)	630.9454	492.5902	421.2691	240.3853	108.1039	0.0000	0.0000	0.0000	0.0000	232.8970	441.0127	642.7323	(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)	630.9454	492.5902	421.2691	240.3853	108.1039	0.0000	0.0000	0.0000	0.0000	232.8970	441.0127	642.7323	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3209.9358	
Space heating per m ²												34.0613	(99)

8c. Space cooling requirement

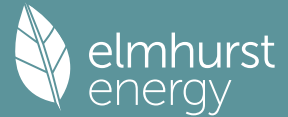
Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	904.3256	711.9159	729.7229	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8061	0.8751	0.8434	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	728.9494	623.0239	615.4372	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	909.6216	870.0809	809.7005	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	130.0840	183.8104	144.5319	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fc = cooled area / (4) =				(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	32.5210	45.9526	36.1330	0.0000	0.0000	0.0000	0.0000	(107)

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Space cooling requirement	114.6066 (107)
Energy for space heating	34.0613 (99)
Energy for space cooling	1.2161 (108)
Total	35.2774 (109)
Fabric Energy Efficiency (TFEE)	35.3 (109)

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Property Reference	HT12-Semi			Issued on Date	07/05/2025
Assessment Reference	001	Prop Type Ref			
Property	Highmoor Lane, CLECKHEATON, BD19 6LW				
SAP Rating	94 A	DER	10.40	TER	10.73
Environmental	91 B	% DER < TER			3.08
CO ₂ Emissions (t/year)	0.96	DFEE	34.62	TFEE	35.28
Compliance Check	See BREL	% DFEE < TFEE			1.86
% DPER < TPER	2.18	DPER	54.81	TPER	56.03
Assessor Details	Mr. Paul Goddard			Assessor ID	B342-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	47.1200 (1b)	x 2.5000 (2b)	= 117.8000 (1b) - (3b)
First floor	47.1200 (1c)	x 2.6000 (2c)	= 122.5120 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	240.3120 (5)

2. Ventilation rate

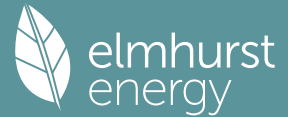
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.2000 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1700 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			2.1600	1.0000	2.1600		(26)
Window			8.7100	1.1450	9.9733		(27)
Patio Door			3.3300	1.3258	4.4148		(27)
GF			47.1200	0.1100	5.1832	9.0000	424.0800 (28a)
Main	100.7250	14.2000	86.5250	0.1800	15.5745	18.0000	1557.4500 (29a)
PIJ	47.1200		47.1200	0.0900	4.2408	9.0000	424.0800 (30)
Total net area of external elements Aum(A, m ²)			194.9650				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.5466		(33)
Main dwelling							
Party Wall 1			48.8500	0.0000	0.0000	20.0000	977.0000 (32)
Internal Wall 1			152.3200			75.0000	11424.0005 (32c)
Internal Floor 1			47.1200			18.0000	848.1600 (32d)
Internal Ceiling 1			47.1200			9.0000	424.0800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	16078.8505 (34)

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

170.6160 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	9.8900	0.0500	0.4945
E2 Other lintels (including other steel lintels)	9.8900	0.0500	0.4945
E3 Sill	27.1600	0.0500	1.3580
E4 Jamb	19.7500	0.1000	1.9750
E5 Ground floor (normal)	19.7500	0.0700	1.3825
E6 Intermediate floor within a dwelling	10.1900	0.0900	0.9171
E16 Corner (normal)	10.1900	0.0600	0.6114
E18 Party wall between dwellings	9.5900	0.0800	0.7672
P1 Party wall - Ground floor	9.5900	0.1200	1.1508
P4 Party wall - Roof (insulation at ceiling level)	10.1600	0.0600	0.6096
E10 Eaves (insulation at ceiling level)	8.8000	0.0600	0.5280
E12 Gable (insulation at ceiling level)			

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

10.2886 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 51.8352 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	39.6515	39.6515	39.6515	39.6515	39.6515	39.6515	39.6515	39.6515	39.6515	39.6515	39.6515	39.6515
Heat transfer coeff	91.4866	91.4866	91.4866	91.4866	91.4866	91.4866	91.4866	91.4866	91.4866	91.4866	91.4866	91.4866
Average = Sum(39)m / 12 =												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9708	0.9708	0.9708	0.9708	0.9708	0.9708	0.9708	0.9708	0.9708	0.9708	0.9708	0.9708
HLP (average)												
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6794 (42)
Hot water usage for mixer showers	69.1449	68.1058	66.5916	63.6945	61.5565	59.1722	57.8170	59.3197	60.9670	63.5270	66.4863	68.8800	(42a)
Hot water usage for baths	29.8578	29.4144	28.7899	27.6386	26.7764	25.8205	25.3041	25.9242	26.5993	27.6223	28.7973	29.7569	(42b)
Hot water usage for other uses	42.0700	40.5402	39.0104	37.4805	35.9507	34.4209	34.4209	35.9507	37.4805	39.0104	40.5402	42.0700	(42c)
Average daily hot water use (litres/day)													129.6777 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	141.0727	138.0604	134.3919	128.8136	124.2837	119.4136	117.5420	121.1946	125.0469	130.1596	135.8238	140.7069 (44)
Energy conte	223.4247	196.5961	206.5554	176.3394	167.3097	146.8329	142.1569	150.0642	154.1953	176.6253	193.5060	220.3130 (45)
Energy content (annual)										Total =	Sum (45) m =	2153.9189
Distribution loss (46)m = 0.15 x (45)m	33.5137	29.4894	30.9833	26.4509	25.0965	22.0249	21.3235	22.5096	23.1293	26.4938	29.0259	33.0469 (46)

Water storage loss:

Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
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If cylinder contains dedicated solar storage

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	1.5649	1.4421	1.5985	1.4729	1.4808	1.3782	1.3636	1.3792	1.3518	1.4491	1.4670	1.5519	(59)

Total heat required for water heating calculated for each month

WWHRS	224.9896	198.0382	208.1539	177.8123	168.7905	148.2112	143.5205	151.4434	155.5471	178.0744	194.9730	221.8649	(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	224.9896	198.0382	208.1539	177.8123	168.7905	148.2112	143.5205	151.4434	155.5471	178.0744	194.9730	221.8649	(64)

Total per year (kWh/year)													2171.4190 (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	74.6799	65.7287	69.0793	59.0011	56.0007	49.1665	47.6081	50.2412	51.6079	59.0902	64.7075	73.6420	(65)
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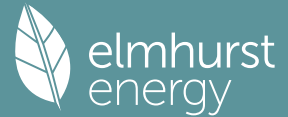
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	133.9713	133.9713	133.9713	133.9713	133.9713	133.9713	133.9713	133.9713	133.9713	133.9713	133.9713	133.9713	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	136.1903	150.7821	136.1903	140.7299	136.1903	140.7299	136.1903	136.1903	140.7299	136.1903	140.7299	136.1903	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	246.6658	249.2254	242.7752	229.0436	211.7099	195.4187	184.5351	181.9755	188.4256	202.1573	219.4910	235.7822	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3971	36.3971	36.3971	36.3971	36.3971	36.3971	36.3971	36.3971	36.3971	36.3971	36.3971	36.3971	(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)	-107.1770	-107.1770	-107.1770	-107.1770	-107.1770	-107.1770	-107.1770	-107.1770	-107.1770	-107.1770	-107.1770	-107.1770	(71)
Water heating gains (Table 5)	100.3763	97.8106	92.8485	81.9459	75.2697	68.2868	63.9893	67.5284	71.6776	79.4223	89.8715	98.9812	(72)
Total internal gains	549.4237	564.0094	538.0054	517.9108	489.3613	467.6268	447.9061	448.8856	464.0246	483.9612	516.2838	537.1451	(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
Southeast	4.2700	36.7938	0.3300	0.0000	0.7700	39.9216 (77)
Southwest	1.2100	36.7938	0.3300	0.0000	0.7700	11.3127 (79)
Northwest	3.2300	11.2829	0.3300	0.0000	0.7700	9.2604 (81)
Northwest	3.3300	11.2829	0.6300	0.7000	0.7700	11.4826 (81)

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Solar gains	71.9772	129.4937	195.4800	272.8844	333.6522	343.5552	326.0986	278.8802	221.9885	148.0526	87.4668	60.7856 (83)
Total gains	621.4008	693.5032	733.4853	790.7952	823.0135	811.1820	774.0047	727.7658	686.0131	632.0138	603.7506	597.9306 (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	48.8197	48.8197	48.8197	48.8197	48.8197	48.8197	48.8197	48.8197	48.8197	48.8197	48.8197	48.8197	
alpha	4.2546	4.2546	4.2546	4.2546	4.2546	4.2546	4.2546	4.2546	4.2546	4.2546	4.2546	4.2546	
util living area	0.9870	0.9781	0.9624	0.9177	0.8229	0.6606	0.5041	0.5531	0.7746	0.9333	0.9775	0.9889 (86)	
MIT	19.5478	19.7382	20.0144	20.3945	20.7244	20.9212	20.9804	20.9710	20.8414	20.4258	19.9178	19.4983 (87)	
Th 2	20.1078	20.1078	20.1078	20.1078	20.1078	20.1078	20.1078	20.1078	20.1078	20.1078	20.1078	20.1078 (88)	
util rest of house	0.9841	0.9734	0.9539	0.8983	0.7814	0.5874	0.4088	0.4562	0.7110	0.9136	0.9717	0.9865 (89)	
MIT 2	18.4070	18.6483	18.9967	19.4659	19.8507	20.0519	20.0986	20.0931	19.9817	19.5119	18.8784	18.3442 (90)	
Living area fraction	fLA = Living area / (4) =												0.1443 (91)
MIT	18.5717	18.8056	19.1436	19.5999	19.9768	20.1773	20.2259	20.2198	20.1058	19.6438	19.0284	18.5108 (92)	
Temperature adjustment													-0.1500
adjusted MIT	18.4217	18.6556	18.9936	19.4499	19.8268	20.0273	20.0759	20.0698	19.9558	19.4938	18.8784	18.3608 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9764	0.9628	0.9399	0.8808	0.7665	0.5803	0.4053	0.4519	0.6988	0.8963	0.9607	0.9796 (94)
Useful gains	606.7621	667.7067	689.3941	696.5029	630.8020	470.7097	313.6996	328.8957	479.3723	566.4756	580.0469	585.7222 (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	1291.9440	1258.4513	1142.9941	965.1730	743.4959	496.5278	317.9956	335.7400	535.7257	813.6656	1077.5632	1295.5205 (97)
Space heating kWh	509.7753	396.9804	337.4784	193.4425	83.8442	0.0000	0.0000	0.0000	0.0000	183.9093	358.2118	528.0899 (98a)
Space heating requirement - total per year (kWh/year)												2591.7318
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	509.7753	396.9804	337.4784	193.4425	83.8442	0.0000	0.0000	0.0000	0.0000	183.9093	358.2118	528.0899 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2591.7318
Space heating per m2	(98c) / (4) =											27.5014 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												88.7000 (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	509.7753	396.9804	337.4784	193.4425	83.8442	0.0000	0.0000	0.0000	0.0000	183.9093	358.2118	528.0899 (98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)
Space heating fuel (main heating system)	574.7185	447.5540	380.4717	218.0862	94.5256	0.0000	0.0000	0.0000	0.0000	207.3386	403.8464	595.3663 (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	224.9896	198.0382	208.1539	177.8123	168.7905	148.2112	143.5205	151.4434	155.5471	178.0744	194.9730	221.8649 (64)
Efficiency of water heater (217)m	84.4576	84.1079	83.4760	82.2387	79.9387	76.2000	76.2000	76.2000	76.2000	82.0765	83.8519	76.2000 (216)
Fuel for water heating, kWh/month	266.3934	235.4573	249.3577	216.2149	211.1499	194.5029	188.3471	198.7447	204.1300	216.9615	232.5207	262.2683 (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	11.3002	10.2066	11.3002	10.9357	11.3002	10.9357	11.3002	11.3002	10.9357	11.3002	10.9357	11.3002 (231)
Lighting	31.9660	25.6444	23.0899	16.9166	13.0669	10.6758	11.9201	15.4942	20.1254	26.4056	29.8250	32.8545 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-37.6797	-53.7202	-78.0480	-88.7036	-96.4372	-90.2980	-89.2346	-83.9213	-74.5724	-61.9463	-41.6592	-32.5104 (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	-19.4240	-41.0906	-82.1012	-123.9256	-164.4473	-165.4379	-163.4420	-138.0581	-100.7944	-58.9021	-25.9807	-15.3379 (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												2921.9074 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												76.2000
Water heating fuel used												2676.0483 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:
(MEVDcentralised, Database: total watage = 4.6540, total flow = 29.0000, SFP = 0.1605)

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mechanical ventilation fans (SFP = 0.1605)	47.0504 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	133.0504 (231)
Electricity for lighting (calculated in Appendix L)	257.9843 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1927.6727 (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	4061.3177 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2921.9074	0.2100	613.6005 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2676.0483	0.2100	561.9701 (264)
Space and water heating			1175.5707 (265)
Pumps, fans and electric keep-hot	133.0504	0.1432	18.8440 (267)
Energy for lighting	257.9843	0.1490	38.4448 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-828.7309	0.1387	-114.9441
PV Unit electricity exported	-1098.9418	0.1258	-138.1970
Total			-253.1411 (269)
Total CO2, kg/year			979.7183 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.4000 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2921.9074	1.1300	3301.7553 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2676.0483	1.1300	3023.9346 (278)
Space and water heating			6325.6899 (279)
Pumps, fans and electric keep-hot	133.0504	1.5335	203.0649 (281)
Energy for lighting	257.9843	1.5547	401.0997 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-828.7309	1.5170	-1257.2220
PV Unit electricity exported	-1098.9418	0.4616	-507.2710
Total			-1764.4930 (283)
Total Primary energy kWh/year			5165.3616 (286)
Dwelling Primary energy Rate (DPER)			54.8100 (287)

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

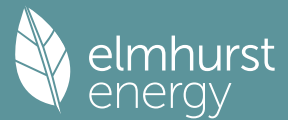
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	47.1200 (1b)	x 2.5000 (2b)	= 117.8000 (1b) - (3b)
First floor	47.1200 (1c)	x 2.6000 (2c)	= 122.5120 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	240.3120 (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) = 0.1248 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3748 (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) = 0.3186 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4062	0.3983	0.3903	0.3505	0.3425	0.3027	0.3027	0.2947	0.3186	0.3425	0.3584	0.3744 (22b)
	0.5825	0.5793	0.5762	0.5614	0.5587	0.5458	0.5458	0.5434	0.5508	0.5587	0.5642	0.5701 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.1600	1.0000	2.1600		(26)
TER Opening Type			12.0400	1.1450	13.7863		(27)
GF			47.1200	0.1300	6.1256		(28a)
Main	100.7250	14.2000	86.5250	0.1800	15.5745		(29a)
PIJ	47.1200		47.1200	0.1100	5.1832		(30)
Total net area of external elements Aum(A, m2)			194.9650				(31)
Fabric heat loss, W/K = Sum (A x U)					42.8296		(33)
Main dwelling							
Party Wall 1			48.8500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							170.6160 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value		Total
E2 Other lintels (including other steel lintels)				9.8900	0.0500		0.4945
E3 Sill				9.8900	0.0500		0.4945
E4 Jamb				27.1600	0.0500		1.3580
E5 Ground floor (normal)				19.7500	0.1600		3.1600
E6 Intermediate floor within a dwelling				19.7500	0.0000		0.0000
E16 Corner (normal)				10.1900	0.0900		0.9171
E18 Party wall between dwellings				10.1900	0.0600		0.6114
P1 Party wall - Ground floor				9.5900	0.0800		0.7672
P4 Party wall - Roof (insulation at ceiling level)				9.5900	0.1200		1.1508
E10 Eaves (insulation at ceiling level)				10.1600	0.0600		0.6096
E12 Gable (insulation at ceiling level)				8.8000	0.0600		0.5280
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.0911 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	52.9207 (37)

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

(38)m	Jan 46.1949	Feb 45.9408	Mar 45.6917	Apr 44.5219	May 44.3031	Jun 43.2842	Jul 43.2842	Aug 43.0955	Sep 43.6766	Oct 44.3031	Nov 44.7458	Dec 45.2087 (38)
Heat transfer coeff	99.1155	98.8615	98.6124	97.4426	97.2237	96.2048	96.2048	96.0162	96.5973	97.2237	97.6665	98.1294 (39)
Average = Sum(39)m / 12 =												97.4415
HLP	Jan 1.0517	Feb 1.0490	Mar 1.0464	Apr 1.0340	May 1.0317	Jun 1.0208	Jul 1.0208	Aug 1.0188	Sep 1.0250	Oct 1.0317	Nov 1.0364	Dec 1.0413 (40)
HLP (average)												1.0340
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

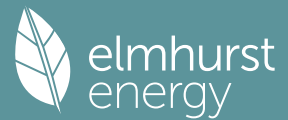
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6794 (42)
Hot water usage for mixer showers	69.1449	68.1058	66.5916	63.6945	61.5565	59.1722	57.8170	59.3197	60.9670	63.5270	66.4863	68.8800 (42a)
Hot water usage for baths	29.8578	29.4144	28.7899	27.6386	26.7764	25.8205	25.3041	25.9242	26.5993	27.6223	28.7973	29.7569 (42b)
Hot water usage for other uses	42.0700	40.5402	39.0104	37.4805	35.9507	34.4209	34.4209	35.9507	37.4805	39.0104	40.5402	42.0700 (42c)
Average daily hot water use (litres/day)												129.6777 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	141.0727	138.0604	134.3919	128.8136	124.2837	119.4136	117.5420	121.1946	125.0469	130.1596	135.8238	140.7069 (44)
Distribution loss (46)m = 0.15 x (45)m	223.4247	196.5961	206.5554	176.3394	167.3097	146.8329	142.1569	150.0642	154.1953	176.6253	193.5060	220.3130 (45)
										Total = Sum(45)m =		2153.9189
Water storage loss:	33.5137	29.4894	30.9833	26.4509	25.0965	22.0249	21.3235	22.5096	23.1293	26.4938	29.0259	33.0469 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	274.3836	242.6235	257.5143	225.6545	218.2686	196.1480	193.1158	201.0232	203.5103	227.5842	242.8210	271.2719 (62)
WWHRS	-31.6102	-27.9563	-29.2742	-24.2402	-22.5910	-19.3313	-18.1200	-19.2688	-20.0009	-23.5788	-26.7120	-31.0248 (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	242.7735	214.6672	228.2401	201.4142	195.6776	176.8167	174.9958	181.7544	183.5095	204.0054	216.1091	240.2471 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2460.2104 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												0.0000 (64a)
Heat gains from water heating, kWh/month	87.0284	76.8751	81.4194	70.9616	68.3702	61.1507	60.0069	62.6361	63.5987	71.4676	76.6695	85.9938 (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	133.9713	133.9713	133.9713	133.9713	133.9713	133.9713	133.9713	133.9713	133.9713	133.9713	133.9713	133.9713 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	136.1903	150.7821	136.1903	140.7299	136.1903	140.7299	136.1903	136.1903	140.7299	136.1903	140.7299	136.1903 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	246.6658	249.2254	242.7752	229.0436	211.7099	195.4187	184.5351	181.9755	188.4256	202.1573	219.4910	235.7822 (68)

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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3971	36.3971	36.3971	36.3971	36.3971	36.3971	36.3971	36.3971	36.3971	36.3971	36.3971	36.3971 (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)	-107.1770	-107.1770	-107.1770	-107.1770	-107.1770	-107.1770	-107.1770	-107.1770	-107.1770	-107.1770	-107.1770	-107.1770 (71)
Water heating gains (Table 5)	116.9737	114.3974	109.4347	98.5578	91.8954	84.9316	80.6544	84.1883	88.3315	96.0587	106.4854	115.5830 (72)
Total internal gains	566.0211	580.5962	554.5915	534.5227	505.9870	484.2715	464.5712	465.5454	480.6785	500.5976	532.8977	553.7469 (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
Southeast				4.2700	36.7938	0.6300	0.7000			0.7700			48.0148 (77)
Southwest				1.2100	36.7938	0.6300	0.7000			0.7700			13.6061 (79)
Northwest				6.5600	11.2829	0.6300	0.7000			0.7700			22.6203 (81)
Solar gains	84.2411	151.0073	226.5721	314.1853	382.4467	393.1115	373.4123	320.4329	256.5892	172.2762	102.2697	71.2074	(83)
Total gains	650.2622	731.6035	781.1636	848.7080	888.4337	877.3830	837.9834	785.9784	737.2676	672.8738	635.1674	624.9543	(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	45.0620	45.1778	45.2919	45.8357	45.9389	46.4254	46.4254	46.5166	46.2368	45.9389	45.7306	45.5149
alpha	4.0041	4.0119	4.0195	4.0557	4.0626	4.0950	4.0950	4.1011	4.0825	4.0626	4.0487	4.0343
util living area	0.9855	0.9756	0.9580	0.9089	0.8095	0.6430	0.4894	0.5375	0.7608	0.9267	0.9749	0.9875 (86)
MIT	19.4216	19.6331	19.9382	20.3628	20.7107	20.9192	20.9793	20.9699	20.8346	20.3940	19.8468	19.3910 (87)
Th 2	20.0404	20.0427	20.0448	20.0551	20.0570	20.0660	20.0660	20.0677	20.0625	20.0570	20.0531	20.0491 (88)
util rest of house	0.9822	0.9703	0.9484	0.8874	0.7651	0.5675	0.3924	0.4387	0.6940	0.9050	0.9684	0.9847 (89)
MIT 2	18.2008	18.4700	18.8557	19.3857	19.7906	20.0098	20.0566	20.0529	19.9332	19.4340	18.7505	18.1677 (90)
Living area fraction	FLA = Living area / (4) =											
MIT	18.3770	18.6378	19.0120	19.5267	19.9234	20.1410	20.1898	20.1852	20.0633	19.5726	18.9087	18.3443 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.3770	18.6378	19.0120	19.5267	19.9234	20.1410	20.1898	20.1852	20.0633	19.5726	18.9087	18.3443 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9743	0.9596	0.9350	0.8731	0.7581	0.5739	0.4056	0.4517	0.6940	0.8911	0.9578	0.9776 (94)
Useful gains	633.5673	702.0627	730.4061	740.9725	673.4809	503.5524	339.9117	355.0135	511.6800	599.6052	608.3475	610.9626 (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	1395.2506	1358.1433	1233.8341	1035.4921	799.5099	533.0704	345.3549	363.4408	576.0401	872.3451	1153.3124	1387.9693 (97)
Space heating kWh	566.6924	440.8862	374.5504	212.0541	93.7656	0.0000	0.0000	0.0000	0.0000	202.9184	392.3747	578.0930 (98a)
Space heating requirement - total per year (kWh/year)	2861.3349											
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	566.6924	440.8862	374.5504	212.0541	93.7656	0.0000	0.0000	0.0000	0.0000	202.9184	392.3747	578.0930 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2861.3349											
Space heating per m2	(98c) / (4) = 30.3622 (99)											

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (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	566.6924	440.8862	374.5504	212.0541	93.7656	0.0000	0.0000	0.0000	0.0000	202.9184	392.3747	578.0930 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	613.3035	477.1496	405.3576	229.4958	101.4779	0.0000	0.0000	0.0000	0.0000	219.6087	424.6479	625.6418 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	242.7735	214.6672	228.2401	201.4142	195.6776	176.8167	174.9958	181.7544	183.5095	204.0054	216.1091	240.2471 (64)
Efficiency of water heater (217)m	86.1333	85.8879	85.4355	84.4920	82.8979	80.3000	80.3000	80.3000	80.3000	84.3700	85.6424	80.3000 (216)
Fuel for water heating, kWh/month	281.8577	249.9389	267.1491	238.3828	236.0465	220.1952	217.9275	226.3441	228.5298	241.7985	252.3388	278.7411 (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	28.2976	22.7014	20.4401	14.9753	11.5674	9.4506	10.5521	13.7161	17.8158	23.3753	26.4023	29.0841 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-43.4073	-60.8389	-86.9248	-97.1026	-104.1449	-96.9746	-95.7568	-90.6749	-81.6196	-69.2678	-47.5883	-37.5686 (233a)

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Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-25.5857	-53.7120	-106.5684	-159.7970	-211.0570	-212.0068	-209.5284	-177.5218	-130.2595	-76.7418	-34.1346	-20.2420	(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												3096.6828	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2939.2501	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												228.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2329.0240	(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												4021.2871	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3096.6828	0.2100	650.3034 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2939.2501	0.2100	617.2425 (264)
Space and water heating			1267.5459 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	228.3782	0.1443	32.9620 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-911.8691	0.1347	-122.8510
PV Unit electricity exported	-1417.1549	0.1259	-178.4790
Total			-301.3300 (269)
Total CO2, kg/year			1011.1072 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.7300 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3096.6828	1.1300	3499.2516 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2939.2501	1.1300	3321.3526 (278)
Space and water heating			6820.6042 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	228.3782	1.5338	350.2941 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-911.8691	1.4979	-1365.9126
PV Unit electricity exported	-1417.1549	0.4623	-655.1433
Total			-2021.0560 (283)
Total Primary energy kWh/year			5279.9431 (286)
Target Primary Energy Rate (TPER)			56.0300 (287)

Predicted Energy Assessment



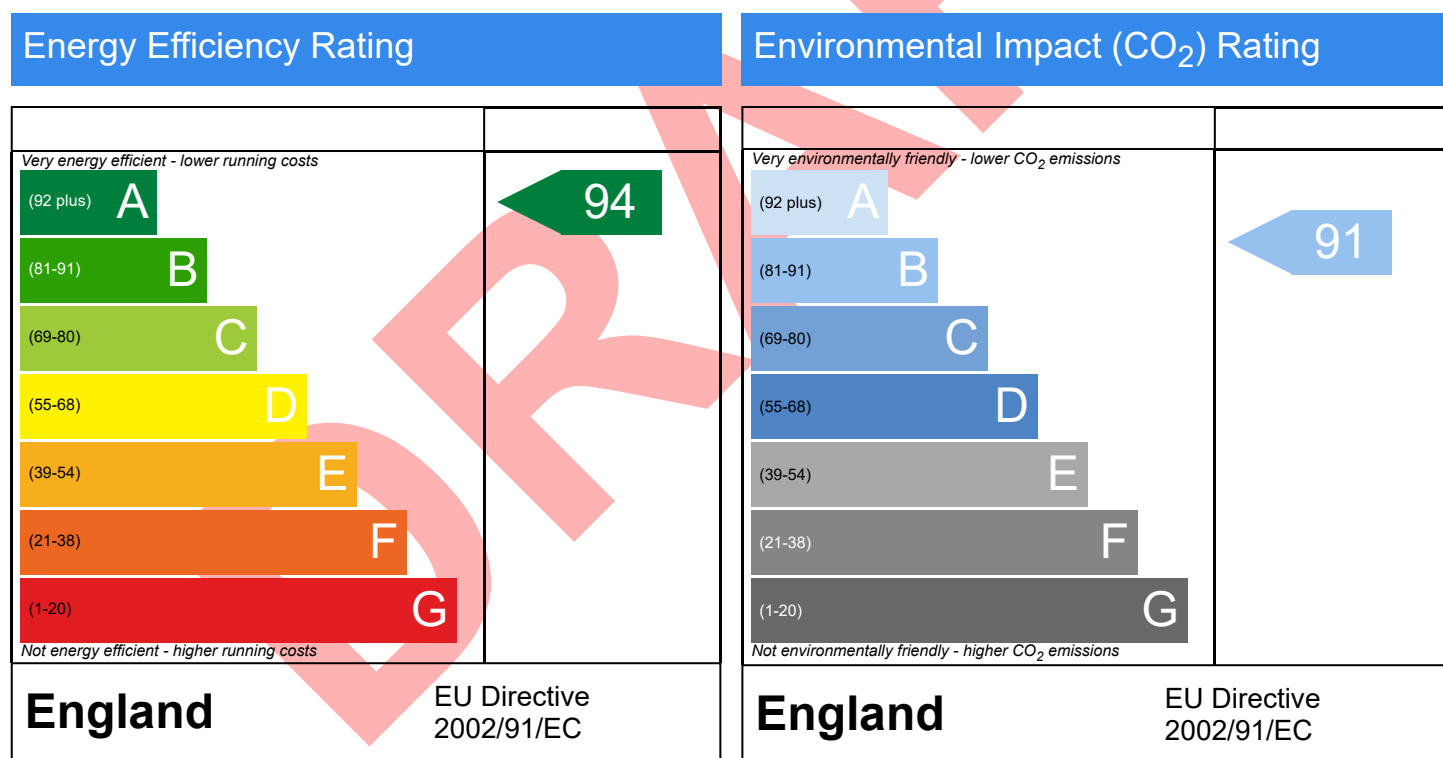
Highmoor Lane, CLECKHEATON, BD19 6LW

Dwelling type:
Date of assessment:
Produced by:
Total floor area:
DRRN:

House, Semi-Detached
07/05/2025
Paul Goddard
94.24 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

Energy Report



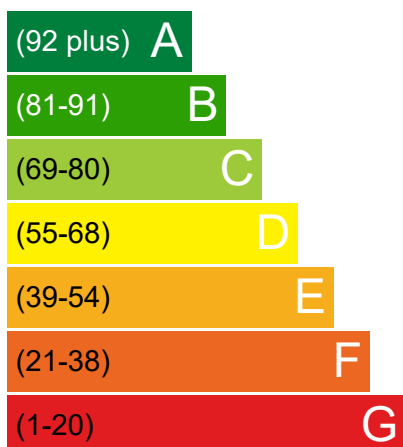
Dwelling Address	Highmoor Lane, CLECKHEATON, BD19 6LW
Reference	HT12-Semi-001
Assessment Date	07/05/2025
Submission Date	
Property Type	House, Semi-Detached
Total Floor Area	94

This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

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

Energy Efficiency Rating

Most energy efficient - lower running costs

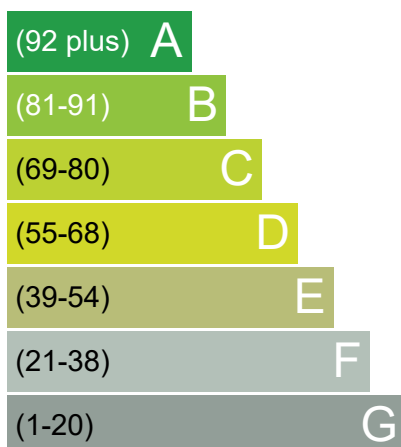


CURRENT POTENTIAL

94 94

Carbon Dioxide (CO2) Emissions Rating

Very environmentally friendly - lower CO2 emissions



CURRENT POTENTIAL

91 91

Additional ratings for your home

	Primary Energy	Energy	Carbon	Cost	HTC
CURRENT	53.96 kWh	4012 kWh	964 kg	219.06 £	91 W/K
POTENTIAL	53.96 kWh	4012 kWh	964 kg	219.06 £	91 W/K

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 0.18 W/m ² K	Very Good
Roof	Average thermal transmittance 0.09 W/m ² K	Very Good
Floor	Average thermal transmittance 0.11 W/m ² K	Very Good
Windows	High performance glazing	Good
Main heating	Boiler and radiators, mains gas	Very Good
Main heating controls	Time and temperature zone control	Very Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 4.0 m ³ /h.m ² (assumed)	Good

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 measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating
Solar water heating	£19	A 94			A 92

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

		Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting		£76	£76	
Heating		£294	£294	
Hot Water		£150	£150	
New Technologies e.g. Impact of PV		-(£301)	-(£301)	
TOTAL		£219	£219	

Estimated energy use and potential savings



Space Heating

2809

kWh per year



Water Heating

2678

kWh per year

About this document

Created by:
Company/Trading name:
Phone number:
Email address:

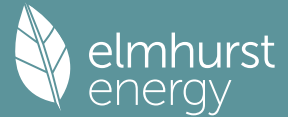
Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g. heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO ₂)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Full SAP Calculation Printout



Property Reference	HT24-Semi				Issued on Date	07/05/2025
Assessment Reference	001	Prop Type Ref				
Property	Highmoor Lane, CLECKHEATON, BD19 6LW					
SAP Rating	95 A	DER	9.28	TER	9.97	
Environmental	91 B	% DER < TER				6.92
CO ₂ Emissions (t/year)	1.13	DFEE	33.43	TFEE	33.47	
Compliance Check	See BREL	% DFEE < TFEE				0.12
% DPER < TPER	5.90	DPER	49.05	TPER	52.12	
Assessor Details	Mr. Paul Goddard				Assessor ID	B342-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	43.9100 (1b)	x 2.5000 (2b)	= 109.7750 (1b) - (3b)
First floor	43.9100 (1c)	x 2.6000 (2c)	= 114.1660 (1c) - (3c)
Second floor	34.9900 (1d)	x 2.5000 (2d)	= 87.4750 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	122.8100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	311.4160 (5)

2. Ventilation rate

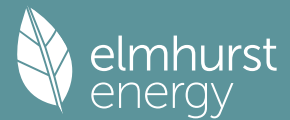
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.2000 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1700 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			2.1600	1.0000	2.1600		(26)
Window			9.0600	1.1450	10.3740		(27)
Patio Door			3.3300	1.3258	4.4148		(27)
Rooflights			1.7300	1.5918	2.7537		(27a)
GF			43.9100	0.1100	4.8301	9.0000	395.1900 (28a)
Main	112.3100	14.5500	97.7600	0.1800	17.5968	18.0000	1759.6800 (29a)
Dwarf (PIR x 0.72)	15.4200		15.4200	0.1100	1.6962	9.0000	138.7800 (29a)
PIJ	15.4200		15.4200	0.0861	1.3280	9.0000	138.7800 (30)
Residual (PIR x 0.72)	8.9200		8.9200	0.1100	0.9812	9.0000	80.2800 (30)
PIR	15.1500	1.7300	13.4200	0.1500	2.0130	9.0000	120.7800 (30)
Total net area of external elements A _{um} (A, m ²)			211.1300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		48.1479		(33)
Main dwelling							
Party Wall 1			59.4300	0.0000	0.0000	20.0000	1188.6000 (32)

Full SAP Calculation Printout



Internal Wall 1	208.2400	75.0000	15618.0004 (32c)
Internal Floor 1	43.9100	18.0000	790.3800 (32d)
Internal Floor 2	34.9900	18.0000	629.8200 (32d)
Internal Ceiling 1	43.9100	9.0000	395.1900 (32e)
Internal Ceiling 2	34.9900	9.0000	314.9100 (32e)

Heat capacity $C_m = \text{Sum}(A \times k)$ (28)...(30) + (32) + (32a)...(32e) = 21570.3904 (34)
Thermal mass parameter (TMP = C_m / TFA) in kJ/m²K 175.6403 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	11.0000	0.0500	0.5500
E2 Other lintels (including other steel lintels)	11.0000	0.0500	0.5500
E3 Sill	23.5100	0.0500	1.1755
E4 Jamb	18.8400	0.1000	1.8840
E5 Ground floor (normal)	18.8400	0.0700	1.3188
E6 Intermediate floor within a dwelling	15.1800	0.0900	1.3662
E16 Corner (normal)	15.1800	0.0600	0.9108
E18 Party wall between dwellings	8.4600	0.0800	0.6768
P1 Party wall - Ground floor	4.5800	0.1200	0.5496
P4 Party wall - Roof (insulation at ceiling level)	10.1600	0.0800	0.8128
E11 Eaves (insulation at rafter level)	4.5800	0.0600	0.2748
E12 Gable (insulation at ceiling level)	5.2400	0.0800	0.4192
E13 Gable (insulation at rafter level)	5.2400	0.0800	0.4192
P5 Party wall - Roof (insulation at rafter level)	1.7600	0.2400	0.4224
R1 Head of roof window	1.7600	0.0000	0.0000
R2 Sill of roof window	3.9200	0.2400	0.9408
R3 Jamb of roof window			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			12.2709 (36)
Point Thermal bridges			0.0000 (36a) =
Total fabric heat loss			60.4188 (37) (33) + (36) + (36a) =

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	51.3836	51.3836	51.3836	51.3836	51.3836	51.3836	51.3836	51.3836	51.3836	51.3836	51.3836	51.3836
Heat transfer coeff	111.8024	111.8024	111.8024	111.8024	111.8024	111.8024	111.8024	111.8024	111.8024	111.8024	111.8024	111.8024
Average = Sum(39)m / 12 =												
HLP	0.9104	0.9104	0.9104	0.9104	0.9104	0.9104	0.9104	0.9104	0.9104	0.9104	0.9104	0.9104
HLP (average)												0.9104 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

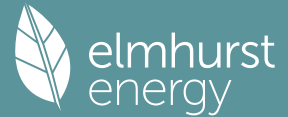
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8735 (42)
Hot water usage for mixer showers	72.3998	71.3118	69.7263	66.6928	64.4541	61.9576	60.5386	62.1120	63.8369	66.5174	69.6160	72.1224 (42a)
Hot water usage for baths	31.2575	30.7933	30.1396	28.9342	28.0317	27.0309	26.4903	27.1395	27.8463	28.9172	30.1473	31.1518 (42b)
Hot water usage for other uses	44.0580	42.4559	40.8538	39.2517	37.6496	36.0475	36.0475	37.6496	39.2517	40.8538	42.4559	44.0580 (42c)
Average daily hot water use (litres/day)												135.7835 (43)
Daily hot water use	147.7153	144.5609	140.7196	134.8787	130.1354	125.0360	123.0764	126.9011	130.9348	136.2883	142.2192	147.3322 (44)
Energy conte	233.9449	205.8528	216.2808	184.6422	175.1872	153.7463	148.8502	157.1301	161.4557	184.9419	202.6174	230.6867 (45)
Energy content (annual)												Total = Sum(45)m = 2255.3363
Distribution loss (46)m = 0.15 x (45)m	35.0917	30.8779	32.4421	27.6963	26.2781	23.0619	22.3275	23.5695	24.2184	27.7413	30.3926	34.6030 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	1.4676	1.3628	1.5232	1.4190	1.4378	1.3481	1.3372	1.3455	1.3109	1.3927	1.3936	1.4569 (61)
Total heat required for water heating calculated for each month	235.4125	207.2156	217.8041	186.0612	176.6250	155.0944	150.1874	158.4756	162.7666	186.3346	204.0110	232.1435 (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	235.4125	207.2156	217.8041	186.0612	176.6250	155.0944	150.1874	158.4756	162.7666	186.3346	204.0110	232.1435 (64)
12Total per year (kWh/year)												2272.1315 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Heat gains from water heating, kWh/month	78.1536	68.7868	72.2942	61.7483	58.6092	51.4577	49.8270	52.5821	54.0118	61.8414	67.7187	77.0675 (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	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	162.3448	179.7389	162.3448	167.7563	162.3448	167.7563	162.3448	162.3448	167.7563	162.3448	167.7563	162.3448 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	288.8276	291.8248	284.2721	268.1934	247.8969	228.8210	216.0772	213.0800	220.6327	236.7114	257.0079	276.0838 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419 (71)
Water heating gains (Table 5)	105.0451	102.3613	97.1696	85.7615	78.7758	71.4690	66.9718	70.6749	75.0163	83.1201	94.0537	103.5854 (72)
Total internal gains	625.3208	643.0282	612.8898	590.8144	558.1207	534.1496	511.4970	512.2030	529.5086	551.2796	587.9212	611.1173 (73)

Full SAP Calculation Printout



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
Southeast					4.1200	36.7938	0.3300	0.0000		0.7700	38.5192 (77)
Northwest					4.9400	11.2829	0.3300	0.0000		0.7700	14.1630 (81)
Southeast					3.3300	36.7938	0.6300	0.7000		0.7700	37.4448 (77)
East					1.7300	26.3832	0.4000	0.7000		1.0000	11.5020 (82)
Solar gains	101.6289	181.3592	268.6934	365.1511	436.8099	445.4553	424.5857	369.6038	302.0068	206.1125	85.9622 (83)
Total gains	726.9497	824.3874	881.5831	955.9655	994.9306	979.6049	936.0827	881.8068	831.5154	757.3921	697.0794 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)											21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)											
tau	53.5925	53.5925	53.5925	53.5925	53.5925	53.5925	53.5925	53.5925	53.5925	53.5925	53.5925
alpha	4.5728	4.5728	4.5728	4.5728	4.5728	4.5728	4.5728	4.5728	4.5728	4.5728	4.5728
util living area	0.9918	0.9846	0.9709	0.9299	0.8382	0.6738	0.5120	0.5615	0.7885	0.9459	0.9932 (86)
MIT	19.6129	19.8038	20.0739	20.4386	20.7509	20.9328	20.9847	20.9768	20.8599	20.4599	19.9666
Th 2	20.1587	20.1587	20.1587	20.1587	20.1587	20.1587	20.1587	20.1587	20.1587	20.1587	20.1587
util rest of house	0.9899	0.9811	0.9640	0.9128	0.7991	0.6030	0.4201	0.4680	0.7278	0.9293	0.9805
MIT 2	18.5227	18.7654	19.1070	19.5591	19.9248	20.1109	20.1515	20.1470	20.0466	19.5921	18.9743
Living area fraction	18.7145	18.9480	19.2771	19.7138	20.0701	20.2554	20.2981	20.2929	20.1896	19.7447	19.1488
MIT	18.5645	18.7980	19.1271	19.5638	19.9201	20.1054	20.1481	20.1429	20.0396	19.5947	18.9988
Temperature adjustment											-0.1500
adjusted MIT											18.5054 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9848	0.9734	0.9530	0.8980	0.7865	0.5982	0.4189	0.4662	0.7181	0.9150	0.9726	0.9872 (94)
Useful gains	715.9226	802.4176	840.1353	858.4980	782.5570	585.9788	392.1366	411.0767	597.1206	692.9842	691.7046	688.1737 (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	1594.8028	1553.8347	1411.7367	1192.2351	919.0238	615.5208	396.6824	418.4692	664.0623	1005.6303	1330.3165	1599.3787 (97)
Space heating kWh	653.8869	504.9523	425.2715	240.2907	101.5313	0.0000	0.0000	0.0000	0.0000	232.6087	459.8005	677.9365 (98a)
Space heating requirement - total per year (kWh/year)												3296.2784
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	653.8869	504.9523	425.2715	240.2907	101.5313	0.0000	0.0000	0.0000	0.0000	232.6087	459.8005	677.9365 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3296.2784
Space heating per m2										(98c) / (4) =		26.8405 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												88.7000 (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
	653.8869	504.9523	425.2715	240.2907	101.5313	0.0000	0.0000	0.0000	0.0000	232.6087	459.8005	677.9365 (98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)
Space heating fuel (main heating system)	737.1893	569.2811	479.4492	270.9028	114.4660	0.0000	0.0000	0.0000	0.0000	262.2420	518.3772	764.3027 (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	235.4125	207.2156	217.8041	186.0612	176.6250	155.0944	150.1874	158.4756	162.7666	186.3346	204.0110	232.1435 (64)
Efficiency of water heater	85.0085	84.6592	84.0313	82.7743	80.3323	76.2000	76.2000	76.2000	76.2000	82.6684	84.4428	76.2000 (216)
Fuel for water heating, kWh/month	276.9281	244.7645	259.1941	224.7813	219.8681	203.5359	197.0963	207.9732	213.6045	225.4001	241.5967	85.1375 (217)
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	12.4825	11.2746	12.4825	12.0799	12.4825	12.0799	12.4825	12.4825	12.0799	12.4825	12.0799	12.4825 (231)
Lighting	40.4878	32.4808	29.2454	21.4264	16.5504	13.5218	15.0978	19.6247	25.4906	33.4450	37.7760	41.6131 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-43.9861	-62.7090	-91.0739	-103.4316	-112.3423	-105.1181	-103.8771	-97.7652	-86.9652	-72.2963	-48.6317	-37.9514 (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)	-22.6349	-47.9036	-95.7668	-144.6357	-192.0228	-193.2405	-190.9123	-161.2108	-117.6294	-68.6935	-30.2815	-17.8717 (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)

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Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												3716.2102	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												76.2000	
Water heating fuel used												2787.4118	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 4.6540, total flow = 29.0000, SFP = 0.1605)													
mechanical ventilation fans (SFP = 0.1605)												60.9718	(230a)
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												146.9718	(231)
Electricity for lighting (calculated in Appendix L)												326.7598	(232)

Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2248.9515	(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												4728.4021	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3716.2102	0.2100	780.4041 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2787.4118	0.2100	585.3565 (264)
Space and water heating			1365.7606 (265)
Pumps, fans and electric keep-hot	146.9718	0.1432	20.7757 (267)
Energy for lighting	326.7598	0.1490	48.6937 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-966.1480	0.1387	-134.0197
PV Unit electricity exported	-1282.8035	0.1257	-161.2948
Total			-295.3145 (269)
Total CO2, kg/year			1139.9155 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			9.2800 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3716.2102	1.1300	4199.3175 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2787.4118	1.1300	3149.7753 (278)
Space and water heating			7349.0928 (279)
Pumps, fans and electric keep-hot	146.9718	1.5335	224.1274 (281)
Energy for lighting	326.7598	1.5547	508.0281 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-966.1480	1.5171	-1465.7483
PV Unit electricity exported	-1282.8035	0.4615	-592.0530
Total			-2057.8014 (283)
Total Primary energy kWh/year			6023.4469 (286)
Dwelling Primary energy Rate (DPER)			49.0500 (287)

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

CALCULATION OF TARGET EMISSIONS

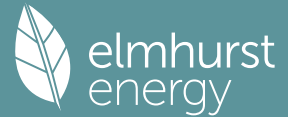
1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)
Main dwelling					
Ground floor	43.9100 (1b)	x	2.5000 (2b)	=	109.7750 (1b) - (3b)
First floor	43.9100 (1c)	x	2.6000 (2c)	=	114.1660 (1c) - (3c)
Second floor	34.9900 (1d)	x	2.5000 (2d)	=	87.4750 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	122.8100				(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	311.4160 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

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Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											Air changes per hour	
Pressure test												40.0000 / (5) =	0.1284 (8)
Pressure Test Method												Yes	
Measured/design AP50												Blower Door	
Infiltration rate												5.0000 (17)	
Number of sides sheltered												0.3784 (18)	
												2 (19)	
Shelter factor												(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) =	0.3217 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)	
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)	
Effective ac	0.4101	0.4021	0.3941	0.3538	0.3458	0.3056	0.3056	0.2976	0.3217	0.3458	0.3619	0.3780 (22b)	
	0.5841	0.5808	0.5776	0.5626	0.5598	0.5467	0.5467	0.5443	0.5517	0.5598	0.5655	0.5714 (25)	

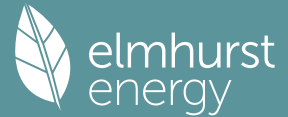
3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K
TER Opaque door			2.1600	1.0000	2.1600		(26)
TER Opening Type			12.3900	1.1450	14.1870		(27)
TER Roof Light			1.7300	1.5918	3.3515		(27a)
GF			43.9100	0.1300	5.7083		(28a)
Main	112.3100	14.5500	97.7600	0.1800	17.5968		(29a)
Dwarf (PIR x 0.72)	15.4200		15.4200	0.1800	2.7756		(29a)
PIJ	15.4200		15.4200	0.1100	1.6962		(30)
Residual (PIR x 0.72)	8.9200		8.9200	0.1100	0.9812		(30)
PIR	15.1500	1.7300	13.4200	0.1100	1.4762		(30)
Total net area of external elements Aum(A, m2)			211.1300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	49.9328		(33)
Main dwelling							
Party Wall 1			59.4300	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							175.6403 (35)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8735 (42)
Hot water usage for mixer showers												
72.3998	71.3118	69.7263	66.6928	64.4541	61.9576	60.5386	62.1120	63.8369	66.5174	69.6160	72.1224 (42a)	
Hot water usage for baths												
31.2575	30.7933	30.1396	28.9342	28.0317	27.0309	26.4903	27.1395	27.8463	28.9172	30.1473	31.1518 (42b)	
Hot water usage for other uses												
44.0580	42.4559	40.8538	39.2517	37.6496	36.0475	36.0475	37.6496	39.2517	40.8538	42.4559	44.0580 (42c)	
Average daily hot water use (litres/day)												135.7835 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	147.7153	144.5609	140.7196	134.8787	130.1354	125.0360	123.0764	126.9011	130.9348	136.2883	142.2192	147.3322 (44)
Energy content	233.9449	205.8528	216.2808	184.6422	175.1872	153.7463	148.8502	157.1301	161.4557	184.9419	202.6174	230.6867 (45)
Energy content (annual)												Total = Sum(45)m =
Distribution loss (46)m = 0.15 x (45)m												2255.3363
35.0917	30.8779	32.4421	27.6963	26.2781	23.0619	22.3275	23.5695	24.2184	27.7413	30.3926	34.6030 (46)	
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
284.9038	251.8802	267.2397	233.9572	226.1461	203.0614	199.8091	208.0890	210.7708	235.9008	251.9324	281.6456 (62)	
WWHRS	-33.0982	-29.2723	-30.6522	-25.3813	-23.6544	-20.2413	-18.9730	-20.1758	-20.9424	-24.6888	-27.9694	-32.4852 (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)

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Output from w/h	251.8057	222.6080	236.5875	208.5760	202.4917	182.8201	180.8362	187.9131	189.8284	211.2121	223.9631	249.1603 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											2547.8020 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Heat gains from water heating, kWh/month	90.5264	79.9529	84.6531	73.7223	70.9895	63.4494	62.2324	64.9855	66.0128	74.2329	79.6990	89.4430 (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	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	162.3448	179.7389	162.3448	167.7563	162.3448	167.7563	162.3448	162.3448	167.7563	162.3448	167.7563	162.3448	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	288.8276	291.8248	284.2721	268.1934	247.8969	228.8210	216.0772	213.0800	220.6327	236.7114	257.0079	276.0838	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677	(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)	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	(71)
Water heating gains (Table 5)	121.6753	118.9776	113.7811	102.3921	95.4160	88.1242	83.6457	87.3461	91.6844	99.7754	110.6931	120.2191	(72)
Total internal gains	641.9510	659.6445	629.5012	607.4450	574.7609	550.8048	528.1710	528.8742	546.1767	567.9349	604.5606	627.7510	(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	
Southeast				7.4500	36.7938		0.6300	0.7000	0.7700		83.7728 (77)	
Northwest				4.9400	11.2829		0.6300	0.7000	0.7700		17.0342 (81)	
East				1.7300	26.3832		0.6300	0.7000	1.0000		18.1157 (82)	
Solar gains	118.9227	213.8080	320.2555	439.7725	529.2661	540.8999	515.1007	446.4173	361.5778	243.9823	144.5404	100.3871 (83)
Total gains	760.8736	873.4525	949.7567	1047.2175	1104.0270	1091.7047	1043.2717	975.2914	907.7545	811.9173	749.1011	728.1381 (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	49.5873	49.7254	49.8616	50.5111	50.6345	51.2170	51.2170	51.3264	50.9911	50.6345	50.3855	50.1277
alpha	4.3058	4.3150	4.3241	4.3674	4.3756	4.4145	4.4145	4.4218	4.3994	4.3756	4.3590	4.3418
util living area	0.9906	0.9822	0.9657	0.9164	0.8127	0.6390	0.4821	0.5322	0.7661	0.9383	0.9824	0.9922 (86)
MIT	19.4979	19.7133	20.0181	20.4322	20.7572	20.9387	20.9859	20.9785	20.8620	20.4400	19.9061	19.4683 (87)
Th 2	20.0968	20.0991	20.1013	20.1118	20.1138	20.1230	20.1230	20.1247	20.1195	20.1138	20.1098	20.1056 (88)
util rest of house	0.9885	0.9781	0.9576	0.8964	0.7697	0.5665	0.3911	0.4388	0.7016	0.9194	0.9777	0.9904 (89)
MIT 2	18.3332	18.6083	18.9945	19.5127	19.8902	20.0805	20.1166	20.1142	20.0114	19.5325	18.8628	18.3017 (90)
Living area fraction	18.5380	18.8027	19.1745	19.6744	20.0427	20.2315	20.2695	20.2662	20.1610	19.6921	19.0463	18.5069 (92)
MIT	18.5380	18.8027	19.1745	19.6744	20.0427	20.2315	20.2695	20.2662	20.1610	19.6921	19.0463	18.5069 (93)
Temperature adjustment												0.0000
adjusted MIT	18.5380	18.8027	19.1745	19.6744	20.0427	20.2315	20.2695	20.2662	20.1610	19.6921	19.0463	18.5069 (93)

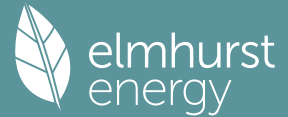
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9832	0.9703	0.9469	0.8848	0.7658	0.5759	0.4066	0.4544	0.7050	0.9082	0.9700	0.9858	(94)
Useful gains	748.0545	847.4733	899.2885	926.5626	845.4996	628.7607	424.2354	443.1758	639.9378	737.3843	726.6174	717.7662	(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	1720.4224	1675.2307	1523.0707	1278.0931	987.2236	658.8153	429.2895	451.3360	712.2038	1075.9054	1420.6388	1710.1010	(97)
Space heating kWh	723.4417	556.2530	464.0940	253.1020	105.4427	0.0000	0.0000	0.0000	0.0000	251.8597	499.6954	738.2971	(98a)
Space heating requirement - total per year (kWh/year)	3592.1855												
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	723.4417	556.2530	464.0940	253.1020	105.4427	0.0000	0.0000	0.0000	0.0000	251.8597	499.6954	738.2971	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)	3592.1855												
Space heating per m2	(98c) / (4) = 29.2499 (99)												

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)											
Fraction of space heat from main system(s)	1.0000 (202)											
Efficiency of main space heating system 1 (in %)	92.4000 (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
	723.4417	556.2530	464.0940	253.1020	105.4427	0.0000	0.0000	0.0000	0.0000	251.8597	499.6954	738.2971 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)

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Space heating fuel (main heating system)	782.9456	602.0054	502.2662	273.9199	114.1154	0.0000	0.0000	0.0000	0.0000	272.5755	540.7959	799.0228	(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	251.8057	222.6080	236.5875	208.5760	202.4917	182.8201	180.8362	187.9131	189.8284	211.2121	223.9631	249.1603	(64)
Efficiency of water heater	86.5078	86.2596	85.7974	84.7971	83.0511	80.3000	80.3000	80.3000	80.3000	84.7596	86.0479	86.5608	(216)
Fuel for water heating, kWh/month	291.0784	258.0675	275.7514	245.9706	243.8159	227.6714	225.2007	234.0139	236.3990	249.1896	260.2772	287.8443	(217)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	33.7321	27.0611	24.3655	17.8512	13.7888	11.2656	12.5786	16.3501	21.2372	27.8644	31.4728	34.6696	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-42.4910	-60.6328	-88.1639	-100.2618	-109.0057	-101.9933	-100.6903	-94.6167	-84.0509	-69.8211	-46.9569	-36.6474	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-21.8019	-46.1144	-92.1477	-139.1369	-184.7234	-185.9392	-183.7977	-155.3094	-113.3942	-66.2418	-29.1987	-17.2249	(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												3887.6466	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												3035.2798	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												272.2370	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2170.3618	(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												5110.8016	(238)

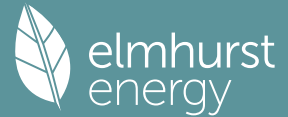
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3887.6466	0.2100	816.4058 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3035.2798	0.2100	637.4088 (264)
Space and water heating			1453.8145 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	272.2370	0.1443	39.2922 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-935.3318	0.1344	-125.6693
PV Unit electricity exported	-1235.0300	0.1257	-155.2833
Total			-280.9527 (269)
Total CO2, kg/year			1224.0834 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.9700 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3887.6466	1.1300	4393.0407 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3035.2798	1.1300	3429.8661 (278)
Space and water heating			7822.9068 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	272.2370	1.5338	417.5662 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-935.3318	1.4966	-1399.7726
PV Unit electricity exported	-1235.0300	0.4615	-569.9862
Total			-1969.7588 (283)
Total Primary energy kWh/year			6400.8150 (286)
Target Primary Energy Rate (TPER)			52.1200 (287)

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Property Reference	HT24-Semi			Issued on Date	07/05/2025
Assessment Reference	001	Prop Type Ref			
Property	Highmoor Lane, CLECKHEATON, BD19 6LW				
SAP Rating	95 A	DER	9.28	TER	9.97
Environmental	91 B	% DER < TER			6.92
CO ₂ Emissions (t/year)	1.13	DFEE	33.43	TFEE	33.47
Compliance Check	See BREL	% DFEE < TFEE			0.12
% DPER < TPER	5.90	DPER	49.05	TPER	52.12
Assessor Details	Mr. Paul Goddard			Assessor ID	B342-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	43.9100 (1b)	x 2.5000 (2b)	= 109.7750 (1b) - (3b)
First floor	43.9100 (1c)	x 2.6000 (2c)	= 114.1660 (1c) - (3c)
Second floor	34.9900 (1d)	x 2.5000 (2d)	= 87.4750 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	122.8100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	311.4160 (5)

2. Ventilation rate

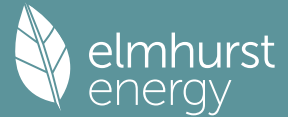
	m ³ per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1284 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000	(17)
Infiltration rate	0.3284	(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) =	0.2792 (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	0.3560	0.3490	0.3420	0.3071	0.3001	0.2652	0.2652	0.2582	0.2792	0.3001	0.3141	0.3280 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5634	0.5609	0.5585	0.5472	0.5450	0.5352	0.5352	0.5333	0.5390	0.5450	0.5493	0.5538 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			2.1600	1.0000	2.1600		(26)
Window			9.0600	1.1450	10.3740		(27)
Patio Door			3.3300	1.3258	4.4148		(27)
Rooflights			1.7300	1.5918	2.7537		(27a)
GF			43.9100	0.1100	4.8301	9.0000	395.1900 (28a)
Main	112.3100	14.5500	97.7600	0.1800	17.5968	18.0000	1759.6800 (29a)
Dwarf (PIR x 0.72)	15.4200		15.4200	0.1100	1.6962	9.0000	138.7800 (29a)
PIJ	15.4200		15.4200	0.0861	1.3280	9.0000	138.7800 (30)
Residual (PIR x 0.72)	8.9200		8.9200	0.1100	0.9812	9.0000	80.2800 (30)
PIR	15.1500	1.7300	13.4200	0.1500	2.0130	9.0000	120.7800 (30)
Total net area of external elements Aum(A, m ²)			211.1300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		48.1479		(33)
Main dwelling							
Party Wall 1			59.4300	0.0000	0.0000	20.0000	1188.6000 (32)
Internal Wall 1			208.2400			75.0000	15618.0004 (32c)
Internal Floor 1			43.9100			18.0000	790.3800 (32d)

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Internal Floor 2	34.9900	18.0000	629.8200 (32d)
Internal Ceiling 1	43.9100	9.0000	395.1900 (32e)
Internal Ceiling 2	34.9900	9.0000	314.9100 (32e)

Heat capacity $C_m = \text{Sum}(A \times k)$ (28)...(30) + (32) + (32a)...(32e) = 21570.3904 (34)
Thermal mass parameter (TMP = C_m / TFA) in kJ/m²K 175.6403 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.0000	0.0500	0.5500
E3 Sill	11.0000	0.0500	0.5500
E4 Jamb	23.5100	0.0500	1.1755
E5 Ground floor (normal)	18.8400	0.1000	1.8840
E6 Intermediate floor within a dwelling	18.8400	0.0700	1.3188
E16 Corner (normal)	15.1800	0.0900	1.3662
E18 Party wall between dwellings	15.1800	0.0600	0.9108
P1 Party wall - Ground floor	8.4600	0.0800	0.6768
P4 Party wall - Roof (insulation at ceiling level)	4.5800	0.1200	0.5496
E11 Eaves (insulation at rafter level)	10.1600	0.0800	0.8128
E12 Gable (insulation at ceiling level)	4.5800	0.0600	0.2748
E13 Gable (insulation at rafter level)	5.2400	0.0800	0.4192
P5 Party wall - Roof (insulation at rafter level)	5.2400	0.0800	0.4192
R1 Head of roof window	1.7600	0.2400	0.4224
R2 Sill of roof window	1.7600	0.0000	0.0000
R3 Jamb of roof window	3.9200	0.2400	0.9408

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.2709 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 60.4188 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	57.8941	57.6413	57.3935	56.2295	56.0118	54.9980	54.9980	54.8103	55.3885	56.0118	56.4523	56.9129 (38)
Heat transfer coeff	118.3129	118.0601	117.8123	116.6483	116.4306	115.4168	115.4168	115.2291	115.8073	116.4306	116.8711	117.3317 (39)
Average = Sum(39)m / 12 =												116.6473

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9634	0.9613	0.9593	0.9498	0.9481	0.9398	0.9398	0.9383	0.9430	0.9481	0.9516	0.9554 (40)
HLP (average)												0.9498
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8735 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	31.2575	30.7933	30.1396	28.9342	28.0317	27.0309	26.4903	27.1395	27.8463	28.9172	30.1473	31.1518	31.1518 (42b)
Hot water usage for other uses	44.0580	42.4559	40.8538	39.2517	37.6496	36.0475	36.0475	37.6496	39.2517	40.8538	42.4559	44.0580	44.0580 (42c)
Average daily hot water use (litres/day)													69.0334 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.3155	73.2492	70.9934	68.1859	65.6813	63.0784	62.5378	64.7891	67.0980	69.7709	72.6032	75.2098	(44)
Energy conte	119.2813	104.3059	109.1141	93.3431	88.4196	77.5622	75.6341	80.2224	82.7385	94.6785	103.4366	117.7604	(45)
Energy content (annual)													Total = Sum(45)m = 1146.4967
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	101.3891	88.6600	92.7470	79.3416	75.1567	65.9279	64.2889	68.1890	70.3277	80.4767	87.9211	100.0964	(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	101.3891	88.6600	92.7470	79.3416	75.1567	65.9279	64.2889	68.1890	70.3277	80.4767	87.9211	100.0964	(64)
12Total per year (kWh/year)													Total per year (kWh/year) = Sum(64)m = 974.5222 (64)
Electric shower(s)	57.9802	51.6608	56.4116	53.8329	54.8431	52.3150	54.0588	54.8431	53.8329	56.4116	55.3509	57.9802	(64a)
													659.5209 (64a)
Heat gains from water heating, kWh/month	39.8423	35.0802	37.2897	33.2936	32.4999	29.5607	29.5869	30.7580	31.0402	34.2221	35.8180	39.5191	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	162.3448	179.7389	162.3448	167.7563	162.3448	167.7563	162.3448	162.3448	167.7563	162.3448	167.7563	162.3448	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	288.8276	291.8248	284.2721	268.1934	247.8969	228.8210	216.0772	213.0800	220.6327	236.7114	257.0079	276.0838	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677	(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)	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	(71)
Water heating gains (Table 5)	53.5515	52.2027	50.1205	46.2412	43.6827	41.0565	39.7674	41.3414	43.1113	45.9974	49.7472	53.1171	(72)
Total internal gains	570.8272	589.8696	562.8407	548.2941	520.0276	503.7371	484.2926	482.8695	497.6036	511.1569	540.6147	557.6490	(73)

6. Solar gains

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[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
-----	-----	-----	-----	-----	-----	-----
Southeast	4.1200	36.7938	0.3300	0.0000	0.7700	38.5192 (77)
Northwest	4.9400	11.2829	0.3300	0.0000	0.7700	14.1630 (81)
Southeast	3.3300	36.7938	0.6300	0.7000	0.7700	37.4448 (77)
East	1.7300	26.3832	0.4000	0.7000	1.0000	11.5020 (82)
-----	-----	-----	-----	-----	-----	-----

Solar gains	101.6289	181.3592	268.6934	365.1511	436.8099	445.4553	424.5857	369.6038	302.0068	206.1125	123.2629	85.9622 (83)
Total gains	672.4561	771.2288	831.5340	913.4452	956.8375	949.1924	908.8783	852.4734	799.6104	717.2694	663.8776	643.6111 (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	50.6435	50.7519	50.8587	51.3661	51.4622	51.9142	51.9142	51.9988	51.7392	51.4622	51.2682	51.0670
alpha	4.3762	4.3835	4.3906	4.4244	4.4308	4.4609	4.4609	4.4666	4.4493	4.4308	4.4179	4.4045
util living area	0.9941	0.9885	0.9778	0.9432	0.8625	0.7026	0.5396	0.5914	0.8162	0.9575	0.9886	0.9951 (86)
MIT	19.4387	19.6397	19.9298	20.3410	20.6913	20.9138	20.9791	20.9688	20.8242	20.3717	19.8403	19.4076 (87)
Th 2	20.1140	20.1157	20.1174	20.1254	20.1268	20.1338	20.1338	20.1351	20.1311	20.1268	20.1238	20.1207 (88)
util rest of house	0.9927	0.9858	0.9723	0.9284	0.8259	0.6304	0.4417	0.4928	0.7574	0.9435	0.9854	0.9940 (89)
MIT 2	18.6767	18.8777	19.1660	19.5724	19.8981	20.0854	20.1261	20.1227	20.0197	19.6084	19.0842	18.6509 (90)
Living area fraction	18.8107	19.0117	19.3003	19.7076	20.0376	20.2311	20.2761	20.2715	fLA = Living area / (4) =			0.1759 (91)
MIT	18.8107	19.0117	19.3003	19.7076	20.0376	20.2311	20.2761	20.2715	20.1612	19.7426	19.2172	18.7839 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8107	19.0117	19.3003	19.7076	20.0376	20.2311	20.2761	20.2715	20.1612	19.7426	19.2172	18.7839 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9899	0.9813	0.9657	0.9198	0.8217	0.6391	0.4584	0.5091	0.7597	0.9357	0.9810	0.9915 (94)
Useful gains	665.6447	756.8446	803.0540	840.2082	786.2372	606.6238	416.6073	433.9695	607.4600	671.1823	651.2594	638.1724 (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	1716.8042	1666.0314	1508.0379	1260.6922	970.7472	649.9205	424.2895	446.1116	701.9316	1064.4806	1416.1528	1711.1591 (97)
Space heating kWh	782.0627	610.9735	524.5081	302.7485	137.2754	0.0000	0.0000	0.0000	0.0000	292.6139	550.7232	798.3021 (98a)
Space heating requirement - total per year (kWh/year)												3999.2074
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	782.0627	610.9735	524.5081	302.7485	137.2754	0.0000	0.0000	0.0000	0.0000	292.6139	550.7232	798.3021 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3999.2074
Space heating per m2										(98c) / (4) =		32.5642 (99)

8c. Space cooling requirement

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

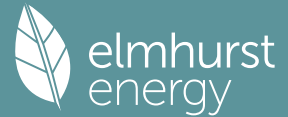
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1084.9183	854.0847	875.7413	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7894	0.8661	0.8338	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	856.4179	739.7369	730.1889	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1016.6475	973.8022	913.2901	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	115.3653	174.1446	136.2273	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	28.8413	43.5362	34.0568	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												106.4343 (107)
Energy for space heating												32.5642 (99)
Energy for space cooling												0.8667 (108)
Total												33.4308 (109)
Fabric Energy Efficiency (DFEE)												33.4 (109)

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

1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	43.9100 (1b)	x 2.5000 (2b)	= 109.7750 (1b) - (3b)
First floor	43.9100 (1c)	x 2.6000 (2c)	= 114.1660 (1c) - (3c)
Second floor	34.9900 (1d)	x 2.5000 (2d)	= 87.4750 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	122.8100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	311.4160 (5)

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2. Ventilation rate

											m3 per hour				
Number of open chimneys	0 * 80 =											0.0000 (6a)			
Number of open flues	0 * 20 =											0.0000 (6b)			
Number of chimneys / flues attached to closed fire	0 * 10 =											0.0000 (6c)			
Number of flues attached to solid fuel boiler	0 * 20 =											0.0000 (6d)			
Number of flues attached to other heater	0 * 35 =											0.0000 (6e)			
Number of blocked chimneys	0 * 20 =											0.0000 (6f)			
Number of intermittent extract fans	4 * 10 =											40.0000 (7a)			
Number of passive vents	0 * 10 =											0.0000 (7b)			
Number of flueless gas fires	0 * 40 =											0.0000 (7c)			
											Air changes per hour				
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											40.0000 / (5) =		0.1284 (8)	
Pressure test												Yes			
Pressure Test Method												Blower Door			
Measured/design AP50												5.0000 (17)			
Infiltration rate												0.3784 (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) =		0.3217 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)		
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)		
	0.4101	0.4021	0.3941	0.3538	0.3458	0.3056	0.3056	0.2976	0.3217	0.3458	0.3619	0.3780	(22b)		
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)			
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)			
Effective ac	0.5841	0.5808	0.5776	0.5626	0.5598	0.5467	0.5467	0.5443	0.5517	0.5598	0.5655	0.5714	(25)		

3. Heat losses and heat loss parameter

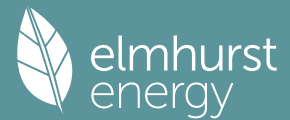
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1600	1.0000	2.1600			(26)
TER Opening Type			12.3900	1.1450	14.1870			(27)
TER Roof Light			1.7300	1.5918	3.3515			(27a)
GF			43.9100	0.1300	5.7083			(28a)
Main	112.3100	14.5500	97.7600	0.1800	17.5968			(29a)
Dwarf (PIR x 0.72)	15.4200		15.4200	0.1800	2.7756			(29a)
PIJ	15.4200		15.4200	0.1100	1.6962			(30)
Residual (PIR x 0.72)	8.9200		8.9200	0.1100	0.9812			(30)
PIR	15.1500	1.7300	13.4200	0.1100	1.4762			(30)
Total net area of external elements Aum(A, m2)			211.1300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		49.9328			(33)
Main dwelling								
Party Wall 1			59.4300	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							175.6403	(35)
List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		
E2 Other lintels (including other steel lintels)				11.0000	0.0500	0.5500		
E3 Sill				11.0000	0.0500	0.5500		
E4 Jamb				23.5100	0.0500	1.1755		
E5 Ground floor (normal)				18.8400	0.1600	3.0144		
E6 Intermediate floor within a dwelling				18.8400	0.0000	0.0000		
E16 Corner (normal)				15.1800	0.0900	1.3662		
E18 Party wall between dwellings				15.1800	0.0600	0.9108		
P1 Party wall - Ground floor				8.4600	0.0800	0.6768		
P4 Party wall - Roof (insulation at ceiling level)				4.5800	0.1200	0.5496		
E11 Eaves (insulation at rafter level)				10.1600	0.0400	0.4064		
E12 Gable (insulation at ceiling level)				4.5800	0.0600	0.2748		
E13 Gable (insulation at rafter level)				5.2400	0.0800	0.4192		
P5 Party wall - Roof (insulation at rafter level)				5.2400	0.0800	0.4192		
R1 Head of roof window				1.7600	0.0800	0.1408		
R2 Sill of roof window				1.7600	0.0600	0.1056		
R3 Jamb of roof window				3.9200	0.0800	0.3136		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.8729	(36)
Point Thermal Bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		60.8057	(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	60.0271	59.6915	59.3625	57.8173	57.5281	56.1823	56.1823	55.9330	56.7007	57.5281	58.1130	58.7245 (38)
Average = Sum(39)m / 12 =	120.8328	120.4972	120.1682	118.6230	118.3338	116.9880	116.9880	116.7387	117.5064	118.3338	118.9187	119.5302 (39)
												118.6216
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9839	0.9812	0.9785	0.9659	0.9636	0.9526	0.9526	0.9506	0.9568	0.9636	0.9683	0.9733 (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													2.8735 (42)
Hot water usage for mixer showers													0.0000 (42a)
Hot water usage for baths	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 (42b)
Hot water usage for other uses	31.2575	30.7933	30.1396	28.9342	28.0317	27.0309	26.4903	27.1395	27.8463	28.9172	30.1473	31.1518	31.1518 (42c)
Average daily hot water use (litres/day)	44.0580	42.4559	40.8538	39.2517	37.6496	36.0475	36.0475	37.6496	39.2517	40.8538	42.4559	44.0580	44.0580 (43)
													69.0334 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

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Energy content (annual)	75.3155	73.2492	70.9934	68.1859	65.6813	63.0784	62.5378	64.7891	67.0980	69.7709	72.6032	75.2098 (44)
Distribution loss (46)m = 0.15 x (45)m	119.2813	104.3059	109.1141	93.3431	88.4196	77.5622	75.6341	80.2224	82.7385	94.6785	103.4366	117.7604 (45)
Total = Sum(45)m =												1146.4967
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
If cylinder contains dedicated solar storage												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Total heat required for water heating calculated for each month												
WWHRS	101.3891	88.6600	92.7470	79.3416	75.1567	65.9279	64.2889	68.1890	70.3277	80.4767	87.9211	100.0964 (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												
Total per year (kWh/year)	101.3891	88.6600	92.7470	79.3416	75.1567	65.9279	64.2889	68.1890	70.3277	80.4767	87.9211	100.0964 (64)
Electric shower(s)												
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	57.9802	51.6608	56.4116	53.8329	54.8431	52.3150	54.0588	54.8431	53.8329	56.4116	55.3509	57.9802 (64a)
Heat gains from water heating, kWh/month												
	39.8423	35.0802	37.2897	33.2936	32.4999	29.5607	29.5869	30.7580	31.0402	34.2221	35.8180	39.5191 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	162.3448	179.7389	162.3448	167.7563	162.3448	167.7563	162.3448	162.3448	167.7563	162.3448	167.7563	162.3448 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	288.8276	291.8248	284.2721	268.1934	247.8969	228.8210	216.0772	213.0800	220.6327	236.7114	257.0079	276.0838 (68)
Pumps, fans	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677 (69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419 (71)
Total internal gains	53.5515	52.2027	50.1205	46.2412	43.6827	41.0565	39.7674	41.3414	43.1113	45.9974	49.7472	53.1171 (72)
	570.8272	589.8696	562.8407	548.2941	520.0276	503.7371	484.2926	482.8695	497.6036	511.1569	540.6147	557.6490 (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	
Southeast				7.4500	36.7938		0.6300	0.7000		0.7700	83.7728 (77)	
Northwest				4.9400	11.2829		0.6300	0.7000		0.7700	17.0342 (81)	
East				1.7300	26.3832		0.6300	0.7000		1.0000	18.1157 (82)	
Solar gains	118.9227	213.8080	320.2555	439.7725	529.2661	540.8999	515.1007	446.4173	361.5778	243.9823	144.5404	100.3871 (83)
Total gains	689.7499	803.6776	883.0962	988.0666	1049.2937	1044.6370	999.3934	929.2868	859.1814	755.1393	685.1551	658.0360 (84)

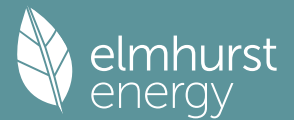
7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	49.5873	49.7254	49.8616	50.5111	50.6345	51.2170	51.2170	51.3264	50.9911	50.6345	50.3855	50.1277
util living area	4.3058	4.3150	4.3241	4.3674	4.3756	4.4145	4.4145	4.4218	4.3994	4.3756	4.3590	4.3418
MIT	0.9935	0.9868	0.9732	0.9295	0.8328	0.6609	0.5013	0.5551	0.7904	0.9508	0.9873	0.9947 (86)
Th 2	19.4166	19.6363	19.9494	20.3830	20.7294	20.9301	20.9836	20.9747	20.8425	20.3878	19.8352	19.3874 (87)
util rest of house	20.0968	20.0991	20.1013	20.1118	20.1138	20.1230	20.1230	20.1247	20.1195	20.1138	20.1098	20.1056 (88)
MIT 2	0.9920	0.9837	0.9667	0.9119	0.7920	0.5880	0.4075	0.4591	0.7281	0.9350	0.9838	0.9934 (89)
Living area fraction	18.6418	18.8615	19.1723	19.5999	19.9173	20.0848	20.1172	20.1149	20.0217	19.6126	19.0684	18.6195 (90)
MIT	18.7780	18.9978	19.3090	19.7376	20.0601	20.2335	20.2696	20.2661	20.1661	19.7489	19.2033	18.7545 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7780	18.9978	19.3090	19.7376	20.0601	20.2335	20.2696	20.2661	20.1661	19.7489	19.2033	18.7545 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9889	0.9788	0.9593	0.9031	0.7892	0.5977	0.4236	0.4752	0.7318	0.9269	0.9790	0.9908 (94)
Ext temp.	682.0998	786.5996	847.1657	892.3242	828.1492	624.3422	423.3581	441.6109	628.7450	699.9574	670.7636	651.9960 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Space heating kWh	1749.4213	1698.7413	1539.2314	1285.5900	989.2816	659.0476	429.2933	451.3285	712.8017	1082.6271	1439.3068	1739.7073 (97)
Space heating requirement - total per year (kWh/year)	794.0872	612.9592	514.8969	283.1514	119.8824	0.0000	0.0000	0.0000	0.0000	284.7062	553.3511	809.2573 (98a)
Solar heating kWh												3972.2917
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	794.0872	612.9592	514.8969	283.1514	119.8824	0.0000	0.0000	0.0000	0.0000	284.7062	553.3511	809.2573 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3972.2917

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Space heating per m2

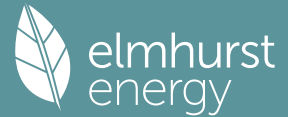
(98c) / (4) = 32.3450 (99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	1099.6868	865.7109	887.2143	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8229	0.8908	0.8597	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	904.9036	771.2063	762.7801	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1120.5096	1072.3128	996.9642	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	155.2363	224.0232	174.2330	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	38.8091	56.0058	43.5582	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement													138.3731 (107)
Energy for space heating													32.3450 (99)
Energy for space cooling													1.1267 (108)
Total													33.4717 (109)
Fabric Energy Efficiency (TFEE)													33.5 (109)

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Property Reference	HT24-Semi			Issued on Date	07/05/2025
Assessment Reference	001	Prop Type Ref			
Property	Highmoor Lane, CLECKHEATON, BD19 6LW				
SAP Rating	95 A	DER	9.28	TER	9.97
Environmental	91 B	% DER < TER			6.92
CO ₂ Emissions (t/year)	1.13	DFEE	33.43	TFEE	33.47
Compliance Check	See BREL	% DFEE < TFEE			0.12
% DPER < TPER	5.90	DPER	49.05	TPER	52.12
Assessor Details	Mr. Paul Goddard			Assessor ID	B342-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	43.9100 (1b)	x 2.5000 (2b)	= 109.7750 (1b) - (3b)
First floor	43.9100 (1c)	x 2.6000 (2c)	= 114.1660 (1c) - (3c)
Second floor	34.9900 (1d)	x 2.5000 (2d)	= 87.4750 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	122.8100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	311.4160 (5)

2. Ventilation rate

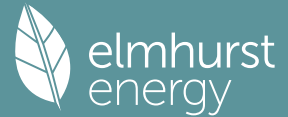
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.2000 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1700 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			2.1600	1.0000	2.1600		(26)
Window			9.0600	1.1450	10.3740		(27)
Patio Door			3.3300	1.3258	4.4148		(27)
Rooflights			1.7300	1.5918	2.7537		(27a)
GF			43.9100	0.1100	4.8301	9.0000	395.1900 (28a)
Main	112.3100	14.5500	97.7600	0.1800	17.5968	18.0000	1759.6800 (29a)
Dwarf (PIR x 0.72)	15.4200		15.4200	0.1100	1.6962	9.0000	138.7800 (29a)
PIJ	15.4200		15.4200	0.0861	1.3280	9.0000	138.7800 (30)
Residual (PIR x 0.72)	8.9200		8.9200	0.1100	0.9812	9.0000	80.2800 (30)
PIR	15.1500	1.7300	13.4200	0.1500	2.0130	9.0000	120.7800 (30)
Total net area of external elements Aum(A, m ²)			211.1300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		48.1479		(33)
Main dwelling							
Party Wall 1			59.4300	0.0000	0.0000	20.0000	1188.6000 (32)

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Internal Wall 1	208.2400	75.0000	15618.0004 (32c)
Internal Floor 1	43.9100	18.0000	790.3800 (32d)
Internal Floor 2	34.9900	18.0000	629.8200 (32d)
Internal Ceiling 1	43.9100	9.0000	395.1900 (32e)
Internal Ceiling 2	34.9900	9.0000	314.9100 (32e)

Heat capacity $C_m = \text{Sum}(A \times k)$ (28)...(30) + (32) + (32a)...(32e) = 21570.3904 (34)
Thermal mass parameter (TMP = C_m / TFA) in kJ/m²K 175.6403 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	11.0000	0.0500	0.5500
E2 Other lintels (including other steel lintels)	11.0000	0.0500	0.5500
E3 Sill	23.5100	0.0500	1.1755
E4 Jamb	18.8400	0.1000	1.8840
E5 Ground floor (normal)	18.8400	0.0700	1.3188
E6 Intermediate floor within a dwelling	15.1800	0.0900	1.3662
E16 Corner (normal)	15.1800	0.0600	0.9108
E18 Party wall between dwellings	8.4600	0.0800	0.6768
P1 Party wall - Ground floor	4.5800	0.1200	0.5496
P4 Party wall - Roof (insulation at ceiling level)	10.1600	0.0800	0.8128
E11 Eaves (insulation at rafter level)	4.5800	0.0600	0.2748
E12 Gable (insulation at ceiling level)	5.2400	0.0800	0.4192
E13 Gable (insulation at rafter level)	5.2400	0.0800	0.4192
P5 Party wall - Roof (insulation at rafter level)	1.7600	0.2400	0.4224
R1 Head of roof window	1.7600	0.0000	0.0000
R2 Sill of roof window	3.9200	0.2400	0.9408
R3 Jamb of roof window			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			12.2709 (36)
Point Thermal bridges			0.0000 (36a)
Total fabric heat loss			60.4188 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	51.3836	51.3836	51.3836	51.3836	51.3836	51.3836	51.3836	51.3836	51.3836	51.3836	51.3836	51.3836
Heat transfer coeff	111.8024	111.8024	111.8024	111.8024	111.8024	111.8024	111.8024	111.8024	111.8024	111.8024	111.8024	111.8024
Average = Sum(39)m / 12 =												
HLP	0.9104	0.9104	0.9104	0.9104	0.9104	0.9104	0.9104	0.9104	0.9104	0.9104	0.9104	0.9104
HLP (average)												0.9104 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

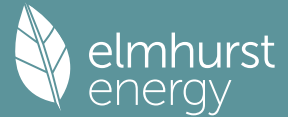
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8735 (42)
Hot water usage for mixer showers	72.3998	71.3118	69.7263	66.6928	64.4541	61.9576	60.5386	62.1120	63.8369	66.5174	69.6160	72.1224 (42a)
Hot water usage for baths	31.2575	30.7933	30.1396	28.9342	28.0317	27.0309	26.4903	27.1395	27.8463	28.9172	30.1473	31.1518 (42b)
Hot water usage for other uses	44.0580	42.4559	40.8538	39.2517	37.6496	36.0475	36.0475	37.6496	39.2517	40.8538	42.4559	44.0580 (42c)
Average daily hot water use (litres/day)												135.7835 (43)
Daily hot water use	147.7153	144.5609	140.7196	134.8787	130.1354	125.0360	123.0764	126.9011	130.9348	136.2883	142.2192	147.3322 (44)
Energy conte	233.9449	205.8528	216.2808	184.6422	175.1872	153.7463	148.8502	157.1301	161.4557	184.9419	202.6174	230.6867 (45)
Energy content (annual)												2255.3363
Distribution loss (46)m = 0.15 x (45)m	35.0917	30.8779	32.4421	27.6963	26.2781	23.0619	22.3275	23.5695	24.2184	27.7413	30.3926	34.6030 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	1.4676	1.3628	1.5232	1.4190	1.4378	1.3481	1.3372	1.3455	1.3109	1.3927	1.3936	1.4569 (61)
Total heat required for water heating calculated for each month	235.4125	207.2156	217.8041	186.0612	176.6250	155.0944	150.1874	158.4756	162.7666	186.3346	204.0110	232.1435 (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	235.4125	207.2156	217.8041	186.0612	176.6250	155.0944	150.1874	158.4756	162.7666	186.3346	204.0110	232.1435 (64)
12Total per year (kWh/year)												2272.1315 (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	78.1536	68.7868	72.2942	61.7483	58.6092	51.4577	49.8270	52.5821	54.0118	61.8414	67.7187	77.0675 (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	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	162.3448	179.7389	162.3448	167.7563	162.3448	167.7563	162.3448	162.3448	167.7563	162.3448	167.7563	162.3448 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	288.8276	291.8248	284.2721	268.1934	247.8969	228.8210	216.0772	213.0800	220.6327	236.7114	257.0079	276.0838 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419 (71)
Water heating gains (Table 5)	105.0451	102.3613	97.1696	85.7615	78.7758	71.4690	66.9718	70.6749	75.0163	83.1201	94.0537	103.5854 (72)
Total internal gains	625.3208	643.0282	612.8898	590.8144	558.1207	534.1496	511.4970	512.2030	529.5086	551.2796	587.9212	611.1173 (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
Southeast					4.1200	36.7938	0.3300	0.0000		0.7700	38.5192 (77)
Northwest					4.9400	11.2829	0.3300	0.0000		0.7700	14.1630 (81)
Southeast					3.3300	36.7938	0.6300	0.7000		0.7700	37.4448 (77)
East					1.7300	26.3832	0.4000	0.7000		1.0000	11.5020 (82)
Solar gains	101.6289	181.3592	268.6934	365.1511	436.8099	445.4553	424.5857	369.6038	302.0068	206.1125	85.9622 (83)
Total gains	726.9497	824.3874	881.5831	955.9655	994.9306	979.6049	936.0827	881.8068	831.5154	757.3921	697.0794 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)											21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)											
tau	53.5925	53.5925	53.5925	53.5925	53.5925	53.5925	53.5925	53.5925	53.5925	53.5925	53.5925
alpha	4.5728	4.5728	4.5728	4.5728	4.5728	4.5728	4.5728	4.5728	4.5728	4.5728	4.5728
util living area	0.9918	0.9846	0.9709	0.9299	0.8382	0.6738	0.5120	0.5615	0.7885	0.9459	0.9932 (86)
MIT	19.6129	19.8038	20.0739	20.4386	20.7509	20.9328	20.9847	20.9768	20.8599	20.4599	19.9666
Th 2	20.1587	20.1587	20.1587	20.1587	20.1587	20.1587	20.1587	20.1587	20.1587	20.1587	20.1587
util rest of house	0.9899	0.9811	0.9640	0.9128	0.7991	0.6030	0.4201	0.4680	0.7278	0.9293	0.9917 (89)
MIT 2	18.5227	18.7654	19.1070	19.5591	19.9248	20.1109	20.1515	20.1470	20.0466	19.5921	18.9743
Living area fraction	18.7145	18.9480	19.2771	19.7138	20.0701	20.2554	20.2981	20.2929	20.1896	19.7447	19.1488
MIT	18.7145	18.9480	19.2771	19.7138	20.0701	20.2554	20.2981	20.2929	20.1896	19.7447	19.1488
Temperature adjustment	18.5645	18.7980	19.1271	19.5638	19.9201	20.1054	20.1481	20.1429	20.0396	19.5947	18.9988
adjusted MIT	18.5645	18.7980	19.1271	19.5638	19.9201	20.1054	20.1481	20.1429	20.0396	19.5947	18.9988

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9848	0.9734	0.9530	0.8980	0.7865	0.5982	0.4189	0.4662	0.7181	0.9150	0.9726	0.9872 (94)
Useful gains	715.9226	802.4176	840.1353	858.4980	782.5570	585.9788	392.1366	411.0767	597.1206	692.9842	691.7046	688.1737 (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	1594.8028	1553.8347	1411.7367	1192.2351	919.0238	615.5208	396.6824	418.4692	664.0623	1005.6303	1330.3165	1599.3787 (97)
Space heating kWh	653.8869	504.9523	425.2715	240.2907	101.5313	0.0000	0.0000	0.0000	0.0000	232.6087	459.8005	677.9365 (98a)
Space heating requirement - total per year (kWh/year)												3296.2784
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	653.8869	504.9523	425.2715	240.2907	101.5313	0.0000	0.0000	0.0000	0.0000	232.6087	459.8005	677.9365 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3296.2784
Space heating per m2										(98c) / (4) =		26.8405 (99)

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

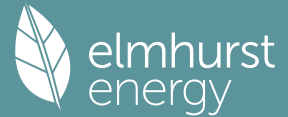
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												88.7000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (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
	653.8869	504.9523	425.2715	240.2907	101.5313	0.0000	0.0000	0.0000	0.0000	232.6087	459.8005	677.9365 (98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)
Space heating fuel (main heating system)	737.1893	569.2811	479.4492	270.9028	114.4660	0.0000	0.0000	0.0000	0.0000	262.2420	518.3772	764.3027 (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	235.4125	207.2156	217.8041	186.0612	176.6250	155.0944	150.1874	158.4756	162.7666	186.3346	204.0110	232.1435 (64)
Efficiency of water heater	85.0085	84.6592	84.0313	82.7743	80.3323	76.2000	76.2000	76.2000	76.2000	82.6684	84.4428	76.2000 (216)
Fuel for water heating, kWh/month	276.9281	244.7645	259.1941	224.7813	219.8681	203.5359	197.0963	207.9732	213.6045	225.4001	241.5967	85.1375 (217)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	12.4825	11.2746	12.4825	12.0799	12.4825	12.0799	12.4825	12.4825	12.0799	12.4825	12.0799	12.4825 (231)
Lighting	40.4878	32.4808	29.2454	21.4264	16.5504	13.5218	15.0978	19.6247	25.4906	33.4450	37.7760	41.6131 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-43.9861	-62.7090	-91.0739	-103.4316	-112.3423	-105.1181	-103.8771	-97.7652	-86.9652	-72.2963	-48.6317	-37.9514 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-22.6349	-47.9036	-95.7668	-144.6357	-192.0228	-193.2405	-190.9123	-161.2108	-117.6294	-68.6935	-30.2815	-17.8717 (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)

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	3716.2102	1.1300	4199.3175 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2787.4118	1.1300	3149.7753 (278)
Space and water heating			7349.0928 (279)
Pumps, fans and electric keep-hot	146.9718	1.5335	224.1274 (281)
Energy for lighting	326.7598	1.5547	508.0281 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-966.1480	1.5171	-1465.7483
PV Unit electricity exported	-1282.8035	0.4615	-592.0530
Total			-2057.8014 (283)
Total Primary energy kWh/year			6023.4469 (286)
Dwelling Primary energy Rate (DPER)			49.0500 (287)

1. Overall dwelling characteristics									
		Area (m ²)		Storey height (m)		Volume (m ³)			
Main dwelling									
	Ground floor	43.9100	(1b)	x	2.5000	(2b)	=	109.7750	(1b) - (3b)
	First floor	43.9100	(1c)	x	2.6000	(2c)	=	114.1660	(1c) - (3c)
	Second floor	34.9900	(1d)	x	2.5000	(2d)	=	87.4750	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)		122.8100							(4)
Dwelling volume					(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	311.4160		(5)

		m3 per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

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Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											
Pressure test	40.0000 / (5) = 0.1284 (8)											
Pressure Test Method	Yes											
Measured/design AP50	Blower Door											
Infiltration rate	5.0000 (17)											
Number of sides sheltered	0.3784 (18)											
	2 (19)											
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)											
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3217 (21)											
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Effective ac	0.4101	0.4021	0.3941	0.3538	0.3458	0.3056	0.3056	0.2976	0.3217	0.3458	0.3619	0.3780 (22b)
	0.5841	0.5808	0.5776	0.5626	0.5598	0.5467	0.5467	0.5443	0.5517	0.5598	0.5655	0.5714 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.1600	1.0000	2.1600		(26)
TER Opening Type			12.3900	1.1450	14.1870		(27)
TER Roof Light			1.7300	1.5918	3.3515		(27a)
GF			43.9100	0.1300	5.7083		(28a)
Main	112.3100	14.5500	97.7600	0.1800	17.5968		(29a)
Dwarf (PIR x 0.72)	15.4200		15.4200	0.1800	2.7756		(29a)
PIJ	15.4200		15.4200	0.1100	1.6962		(30)
Residual (PIR x 0.72)	8.9200		8.9200	0.1100	0.9812		(30)
PIR	15.1500	1.7300	13.4200	0.1100	1.4762		(30)
Total net area of external elements Aum(A, m2)			211.1300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	49.9328		(33)
Main dwelling							
Party Wall 1			59.4300	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							175.6403 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.0000	0.0500	0.5500
E3 Sill	11.0000	0.0500	0.5500
E4 Jamb	23.5100	0.0500	1.1755
E5 Ground floor (normal)	18.8400	0.1600	3.0144
E6 Intermediate floor within a dwelling	18.8400	0.0000	0.0000
E16 Corner (normal)	15.1800	0.0900	1.3662
E18 Party wall between dwellings	15.1800	0.0600	0.9108
P1 Party wall - Ground floor	8.4600	0.0800	0.6768
P4 Party wall - Roof (insulation at ceiling level)	4.5800	0.1200	0.5496
E11 Eaves (insulation at rafter level)	10.1600	0.0400	0.4064
E12 Gable (insulation at ceiling level)	4.5800	0.0600	0.2748
E13 Gable (insulation at rafter level)	5.2400	0.0800	0.4192
P5 Party wall - Roof (insulation at rafter level)	5.2400	0.0800	0.4192
R1 Head of roof window	1.7600	0.0800	0.1408
R2 Sill of roof window	1.7600	0.0600	0.1056
R3 Jamb of roof window	3.9200	0.0800	0.3136

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

Point Thermal bridges	(36a) =	10.8729 (36)
Total fabric heat loss	(33) + (36) + (36a) =	60.8057 (37)

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

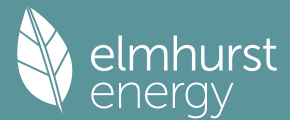
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	60.0271	59.6915	59.3625	57.8173	57.5281	56.1823	56.1823	55.9330	56.7007	57.5281	58.1130	58.7245 (38)
Average = Sum(39)m / 12 =	120.8328	120.4972	120.1682	118.6230	118.3338	116.9880	116.9880	116.7387	117.5064	118.3338	118.9187	119.5302 (39)
												118.6216

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9839	0.9812	0.9785	0.9659	0.9636	0.9526	0.9526	0.9506	0.9568	0.9636	0.9683	0.9733 (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	2.8735 (42)											
Hot water usage for mixer showers	72.3924 (42a)											
Hot water usage for baths	31.2575 (42b)											
Hot water usage for other uses	44.0580 (42c)											
Average daily hot water use (litres/day)	135.7835 (43)											
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	147.7153	144.5609	140.7196	134.8787	130.1354	125.0360	123.0764	126.9011	130.9348	136.2883	142.2192	147.3322 (44)
Energy content (annual)	233.9449	205.8528	216.2808	184.6422	175.1872	153.7463	148.8502	157.1301	161.4557	184.9419	202.6174	230.6867 (45)
Distribution loss (46)m = 0.15 x (45)m	Total = Sum(45)m = 2255.3363											
Water storage loss:	35.0917	30.8779	32.4421	27.6963	26.2781	23.0619	22.3275	23.5695	24.2184	27.7413	30.3926	34.6030 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	284.9038	251.8802	267.2397	233.9572	226.1461	203.0614	199.8091	208.0890	210.7708	235.9008	251.9324	281.6456 (62)
WWHRS	-33.0982	-29.2723	-30.6522	-25.3813	-23.6544	-20.2413	-18.9730	-20.1758	-20.9424	-24.6888	-27.9694	-32.4852 (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)

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Output from w/h
 251.8057 222.6080 236.5875 208.5760 202.4917 182.8201 180.8362 187.9131 189.8284 211.2121 223.9631 249.1603 (64)
 Total per year (kWh/year) = Sum(64)m = 2547.8020 (64)
 2548 (64)

12Total per year (kWh/year)

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

Heat gains from water heating, kWh/month
 90.5264 79.9529 84.6531 73.7223 70.9895 63.4494 62.2324 64.9855 66.0128 74.2329 79.6990 89.4430 (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	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774	143.6774	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	162.3448	179.7389	162.3448	167.7563	162.3448	167.7563	162.3448	162.3448	167.7563	162.3448	167.7563	162.3448	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	288.8276	291.8248	284.2721	268.1934	247.8969	228.8210	216.0772	213.0800	220.6327	236.7114	257.0079	276.0838	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677	37.3677	(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)	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	-114.9419	(71)
Water heating gains (Table 5)	121.6753	118.9776	113.7811	102.3921	95.4160	88.1242	83.6457	87.3461	91.6844	99.7754	110.6931	120.2191	(72)
Total internal gains	641.9510	659.6445	629.5012	607.4450	574.7609	550.8048	528.1710	528.8742	546.1767	567.9349	604.5606	627.7510	(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	
Southeast	7.4500	36.7938	0.6300	0.7000	0.7700	83.7728	(77)
Northwest	4.9400	11.2829	0.6300	0.7000	0.7700	17.0342	(81)
East	1.7300	26.3832	0.6300	0.7000	1.0000	18.1157	(82)

Solar gains 118.9227 213.8080 320.2555 439.7725 529.2661 540.8999 515.1007 446.4173 361.5778 243.9823 144.5404 100.3871 (83)
 Total gains 760.8736 873.4525 949.7567 1047.2175 1104.0270 1091.7047 1043.2717 975.2914 907.7545 811.9173 749.1011 728.1381 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	49.5873	49.7254	49.8616	50.5111	50.6345	51.2170	51.2170	51.3264	50.9911	50.6345	50.3855	50.1277	
alpha	4.3058	4.3150	4.3241	4.3674	4.3756	4.4145	4.4145	4.4218	4.3994	4.3756	4.3590	4.3418	
util living area	0.9906	0.9822	0.9657	0.9164	0.8127	0.6390	0.4821	0.5322	0.7661	0.9383	0.9824	0.9922	(86)
MIT	19.4979	19.7133	20.0181	20.4322	20.7572	20.9387	20.9859	20.9785	20.8620	20.4400	19.9061	19.4683	(87)
Th 2	20.0968	20.0991	20.1013	20.1118	20.1138	20.1230	20.1230	20.1247	20.1195	20.1138	20.1098	20.1056	(88)
util rest of house	0.9885	0.9781	0.9576	0.8964	0.7697	0.5665	0.3911	0.4388	0.7016	0.9194	0.9777	0.9904	(89)
MIT 2	18.3332	18.6083	18.9945	19.5127	19.8902	20.0805	20.1166	20.1142	20.0114	19.5325	18.8628	18.3017	(90)
Living area fraction													(91)
MIT	18.5380	18.8027	19.1745	19.6744	20.0427	20.2315	20.2695	20.2662	20.1610	19.6921	19.0463	18.5069	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5380	18.8027	19.1745	19.6744	20.0427	20.2315	20.2695	20.2662	20.1610	19.6921	19.0463	18.5069	(93)

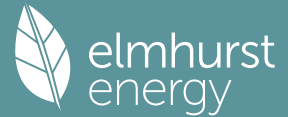
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9832	0.9703	0.9469	0.8848	0.7658	0.5759	0.4066	0.4544	0.7050	0.9082	0.9700	0.9858	(94)
Useful gains	748.0545	847.4733	899.2885	926.5626	845.4996	628.7607	424.2354	443.1758	639.9378	737.3843	726.6174	717.7662	(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	1720.4224	1675.2307	1523.0707	1278.0931	987.2236	658.8153	429.2895	451.3360	712.2038	1075.9054	1420.6388	1710.1010	(97)
Space heating kWh	723.4417	556.2530	464.0940	253.1020	105.4427	0.0000	0.0000	0.0000	0.0000	251.8597	499.6954	738.2971	(98a)
Space heating requirement - total per year (kWh/year)												3592.1855	
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	723.4417	556.2530	464.0940	253.1020	105.4427	0.0000	0.0000	0.0000	0.0000	251.8597	499.6954	738.2971	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3592.1855	
Space heating per m2										(98c) / (4) =		29.2499	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.4000 (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	
	723.4417	556.2530	464.0940	253.1020	105.4427	0.0000	0.0000	0.0000	0.0000	251.8597	499.6954	738.2971	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)

Full SAP Calculation Printout



Space heating fuel (main heating system)	782.9456	602.0054	502.2662	273.9199	114.1154	0.0000	0.0000	0.0000	0.0000	272.5755	540.7959	799.0228	(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	251.8057	222.6080	236.5875	208.5760	202.4917	182.8201	180.8362	187.9131	189.8284	211.2121	223.9631	249.1603	(64)
Efficiency of water heater	86.5078	86.2596	85.7974	84.7971	83.0511	80.3000	80.3000	80.3000	80.3000	84.7596	86.0479	86.5608	(216)
Fuel for water heating, kWh/month	291.0784	258.0675	275.7514	245.9706	243.8159	227.6714	225.2007	234.0139	236.3990	249.1896	260.2772	287.8443	(217)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	33.7321	27.0611	24.3655	17.8512	13.7888	11.2656	12.5786	16.3501	21.2372	27.8644	31.4728	34.6696	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-42.4910	-60.6328	-88.1639	-100.2618	-109.0057	-101.9933	-100.6903	-94.6167	-84.0509	-69.8211	-46.9569	-36.6474	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-21.8019	-46.1144	-92.1477	-139.1369	-184.7234	-185.9392	-183.7977	-155.3094	-113.3942	-66.2418	-29.1987	-17.2249	(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												3887.6466	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												3035.2798	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												272.2370	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2170.3618	(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												5110.8016	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3887.6466	0.2100	816.4058 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3035.2798	0.2100	637.4088 (264)
Space and water heating			1453.8145 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	272.2370	0.1443	39.2922 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-935.3318	0.1344	-125.6693
PV Unit electricity exported	-1235.0300	0.1257	-155.2833
Total			-280.9527 (269)
Total CO2, kg/year			1224.0834 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.9700 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3887.6466	1.1300	4393.0407 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3035.2798	1.1300	3429.8661 (278)
Space and water heating			7822.9068 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	272.2370	1.5338	417.5662 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-935.3318	1.4966	-1399.7726
PV Unit electricity exported	-1235.0300	0.4615	-569.9862
Total			-1969.7588 (283)
Total Primary energy kWh/year			6400.8150 (286)
Target Primary Energy Rate (TPER)			52.1200 (287)

Predicted Energy Assessment



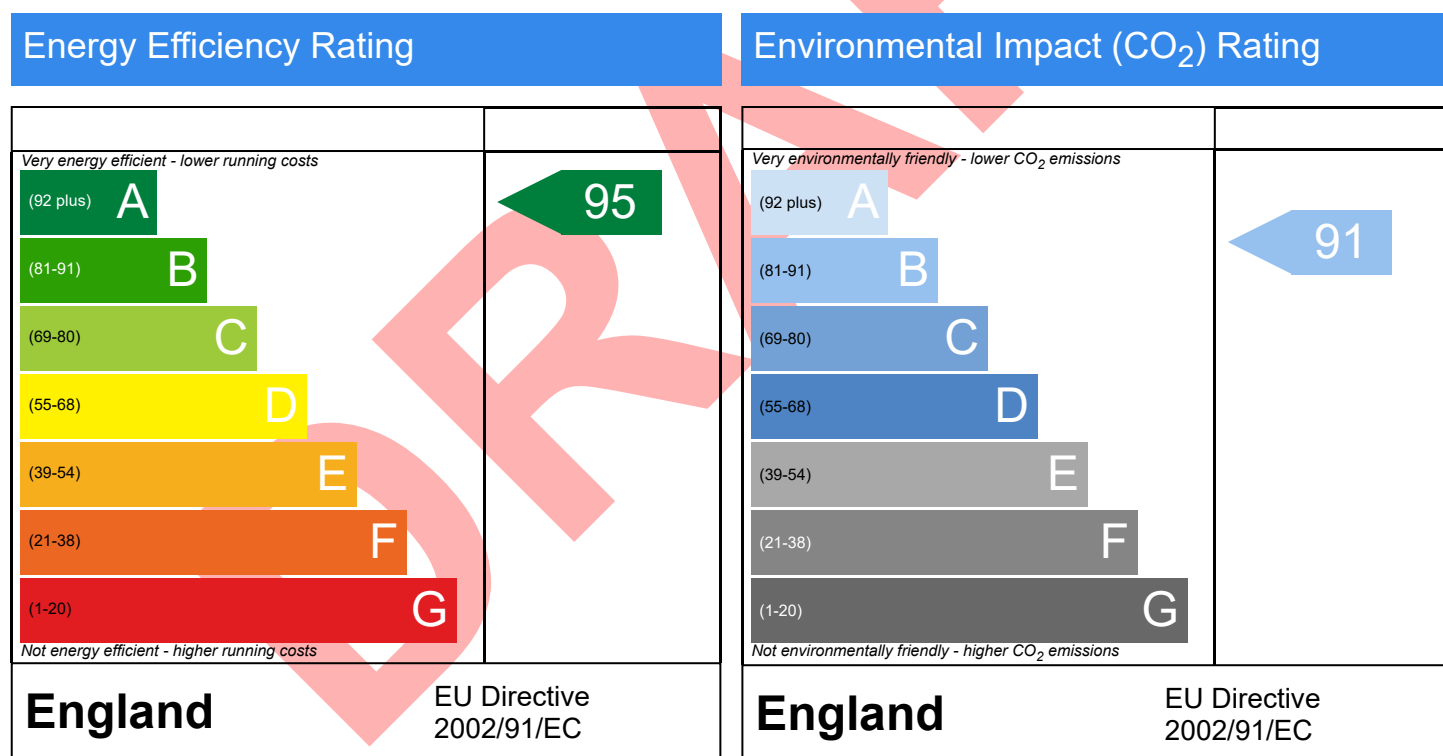
Highmoor Lane, CLECKHEATON, BD19 6LW

Dwelling type:
Date of assessment:
Produced by:
Total floor area:
DRRN:

House, Semi-Detached
07/05/2025
Paul Goddard
122.81 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

Energy Report

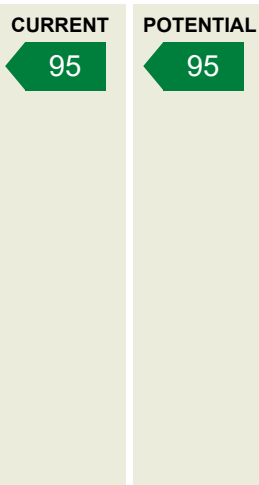
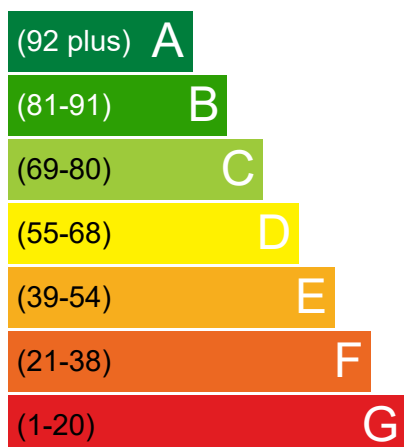
Dwelling Address	Highmoor Lane, CLECKHEATON, BD19 6LW
Reference	HT24-Semi-001
Assessment Date	07/05/2025
Submission Date	
Property Type	House, Semi-Detached
Total Floor Area	123

This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

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

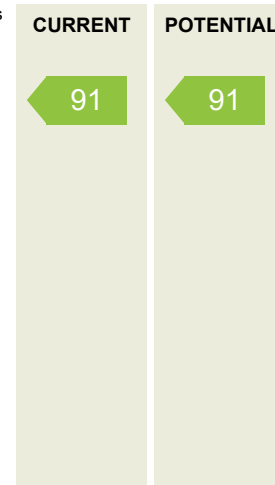
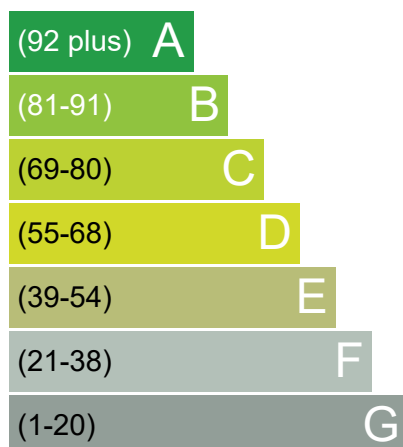
Energy Efficiency Rating

Most energy efficient - lower running costs

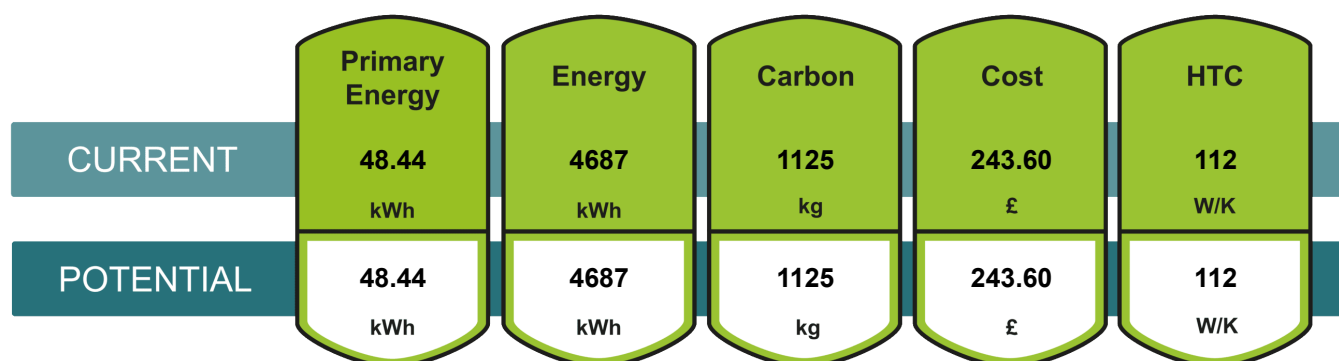


Carbon Dioxide (CO2) Emissions Rating

Very environmentally friendly - lower CO2 emissions



Additional ratings for your home



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 0.17 W/m ² K	Very Good
Roof	Average thermal transmittance 0.11 W/m ² K	Very Good
Floor	Average thermal transmittance 0.11 W/m ² K	Very Good
Windows	High performance glazing	Good
Main heating	Boiler and radiators, mains gas	Very Good
Main heating controls	Time and temperature zone control	Very Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 4.0 m ³ /h.m ² (assumed)	Good

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 measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating
Solar water heating	£20	A 95			A 92

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

		Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting		£96	£96	
Heating		£342	£342	
Hot Water		£156	£156	
New Technologies e.g. Impact of PV		-(£351)	-(£351)	
TOTAL		£244	£244	

Estimated energy use and potential savings



Space Heating

3602

kWh per year



Water Heating

2789

kWh per year

About this document

Created by:
Company/Trading name:
Phone number:
Email address:

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g. heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO ₂)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.