Anderson Goddard Ltd

Independent Energy Specialists, SAP, SBEM, EPC's, U-Value & Condensation Risk, 2D & 3D Thermal Modelling

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

Abacus House, 450 Warrington Road, Culcheth, Cheshire, WA3 5QX

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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

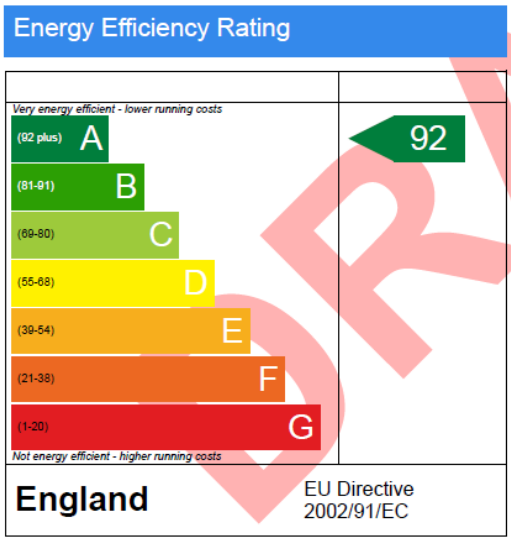
Energy (Consumption)	-2.77%
Primary Energy (Total energy)	0.45%
Carbon emissions	1.09% (AD. Part L1 2021)
Carbon emissions	**32.09% (AD. Part L1 2013)**

Total use

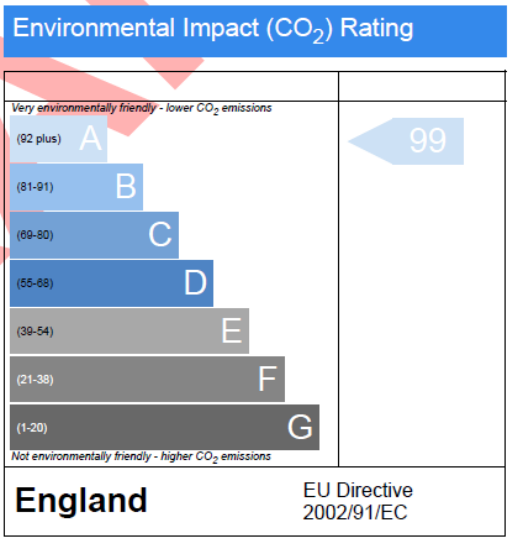
Energy (Consumption)	-1.50%
Primary Energy (Total energy)	1.47%
Carbon emissions	0.74%

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 (CO_2) emissions. The higher the rating the less impact it has on the environment.

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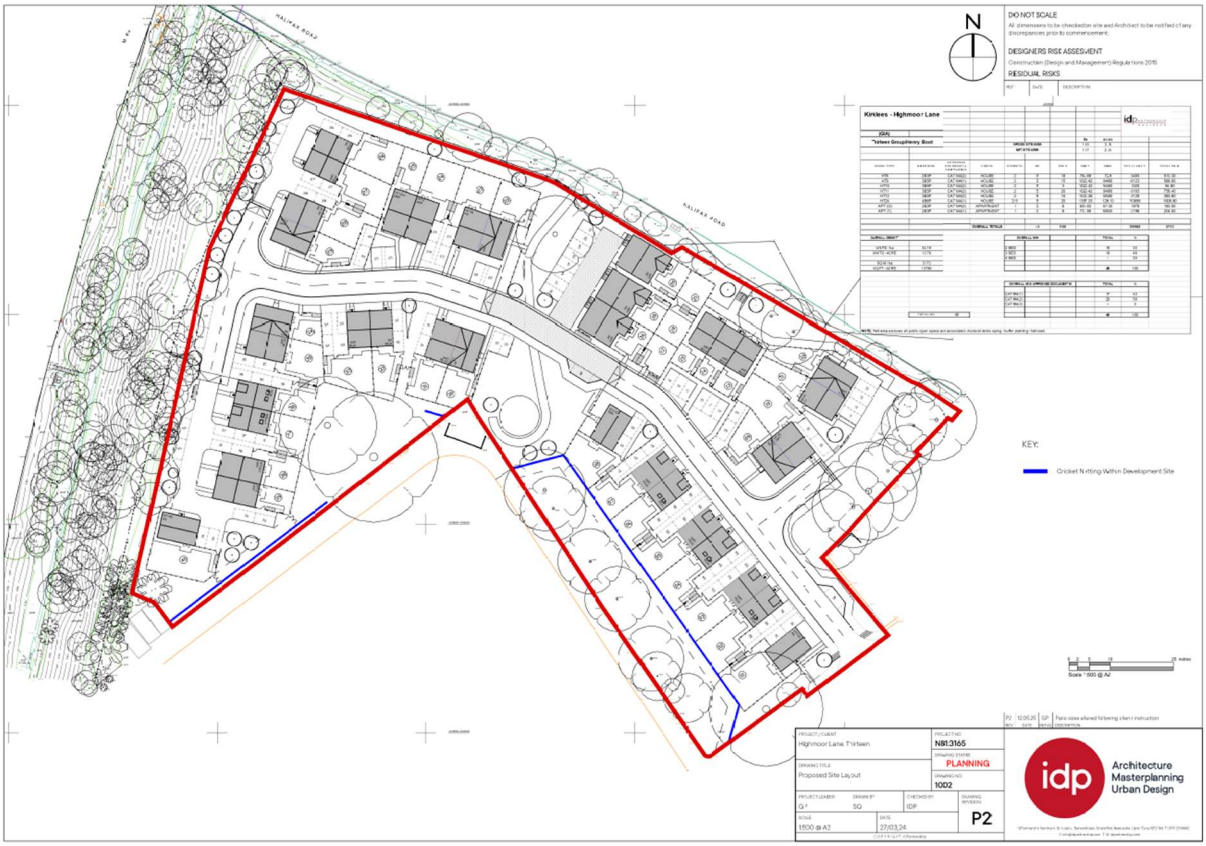
2. The development

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 m²	Total area m²
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/m² K
Walls	0.18	W/m² K
Floor	0.11	W/m² K
Windows	1.20	W/m² K
Doors	1.00	W/m² K
Thermal Bridging	Modelled Thermal bridging details, assessment based on R2 Values	
Air permeability	4.00 m²	

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)	m²
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 m² 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 m² 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 m² 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%

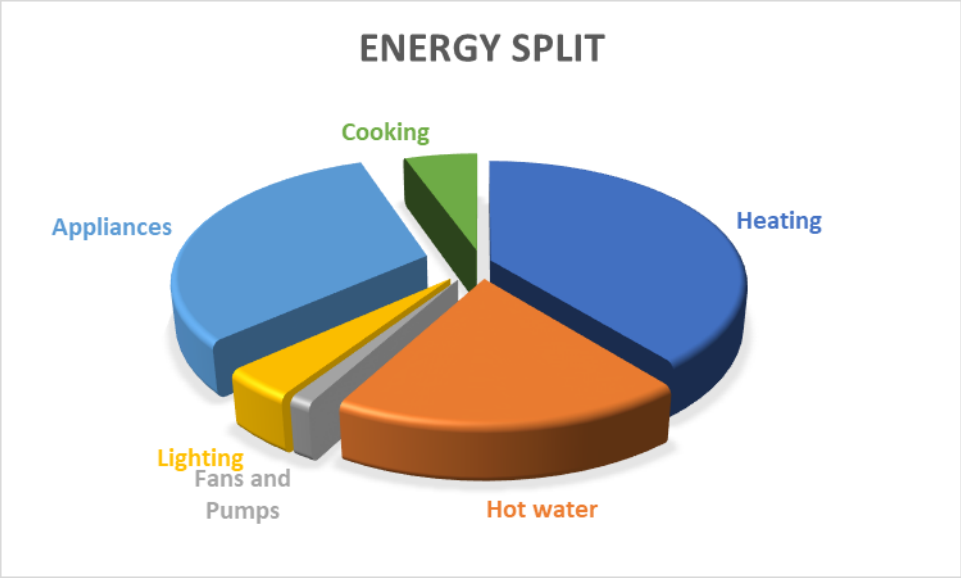
Reduction from Low or Zero Carbon Technologies

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%

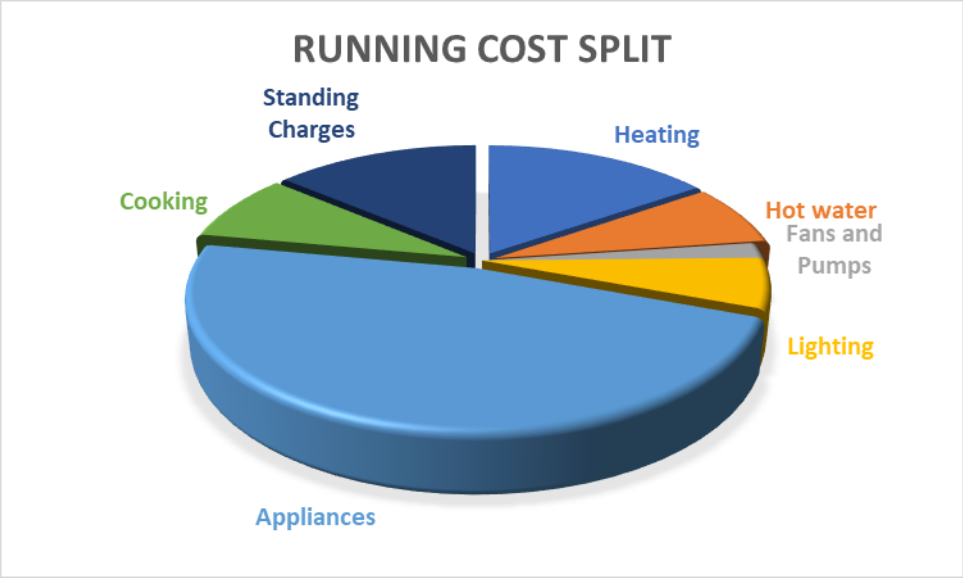
Energy (Primary)	Kwpe
Heating	123,344.08
Hot water	117,296.82
Fans and Pumps	7,790.25
Lighting	14,086.82
Appliances	167,528.78
Cooking	34,142.42
Sub TOTAL	464,189.17
Reduction in PRIMARY energy through LZC technology	-62,781.18
Total	401,407.99
Percentage reduction	13.52%

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

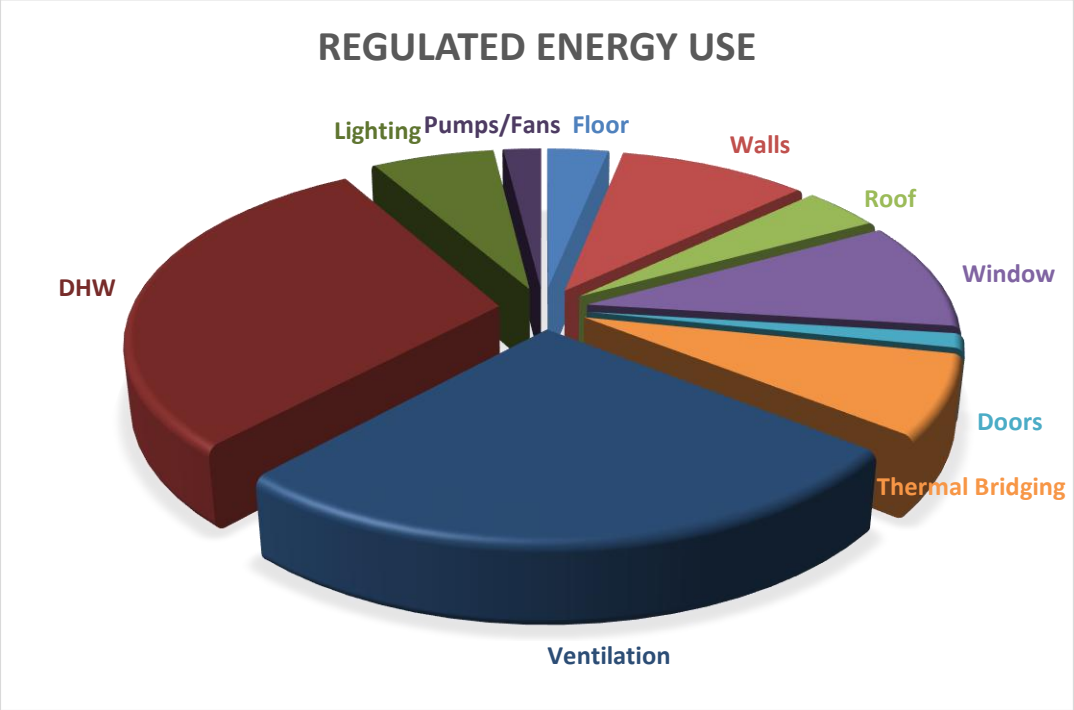


Total running cost split by use (Post April 2022 price cap)



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.

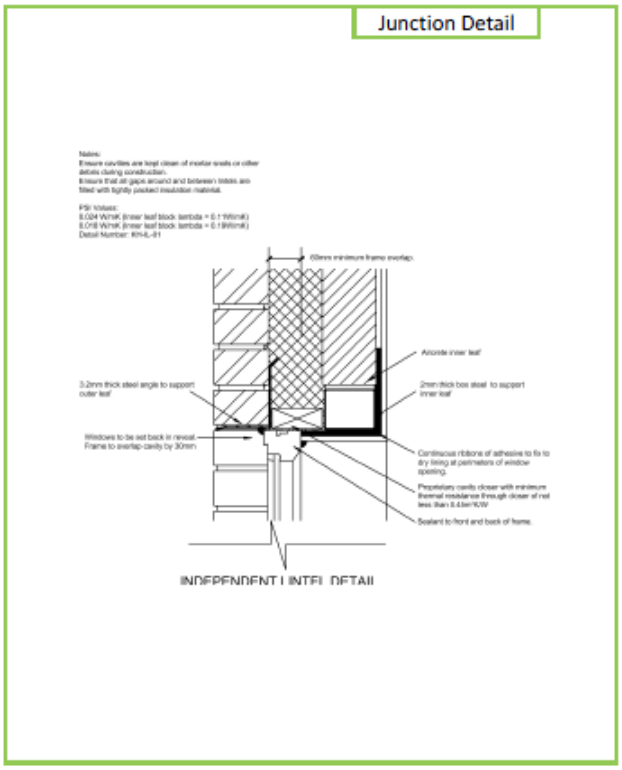
Future retro improvements made to a building's fabric are expensive, disruptive and most of the time impractical and therefore the thermal qualities of the building fabric must be one of the main considerations for long term energy and CO_2 reduction.

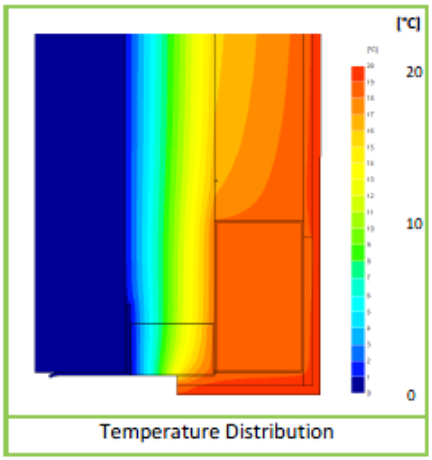
Reducing Energy and Carbon emissions from a development by increasing the fabric specification provides the development with a high degree of longevity, by limiting the heat losses across the building envelope over the dwelling's lifetime.

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

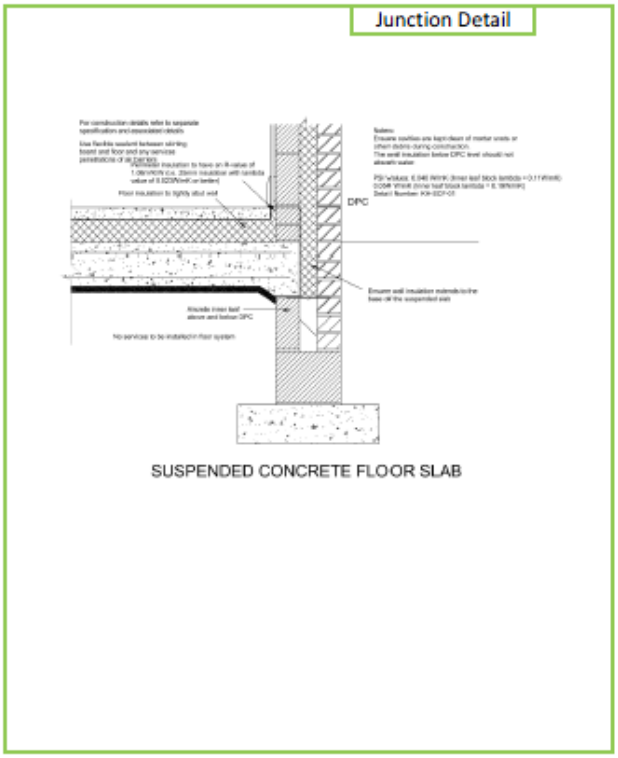


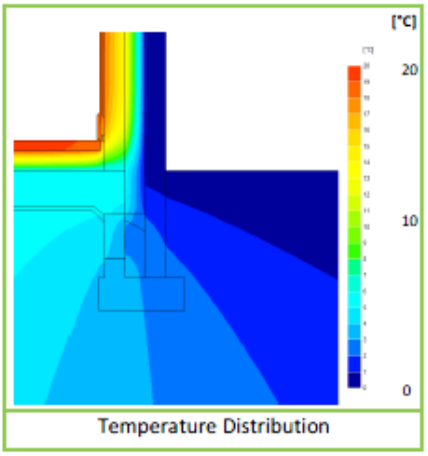


Linear Thermal Transmittance W/m.K	
Ψ =	0.018

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	
Ψ =	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

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

$E_a \times EF_{electricity} / TFA$

Were 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 CO_2 reduction provided by upgrade measures or LZC technologies including heating and innovative technologies will be assessed as a percentage of the total estimated CO_2 emissions which will include heating, ventilation, lighting, pumps and fans from SAP 2005 and also CO_2 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.

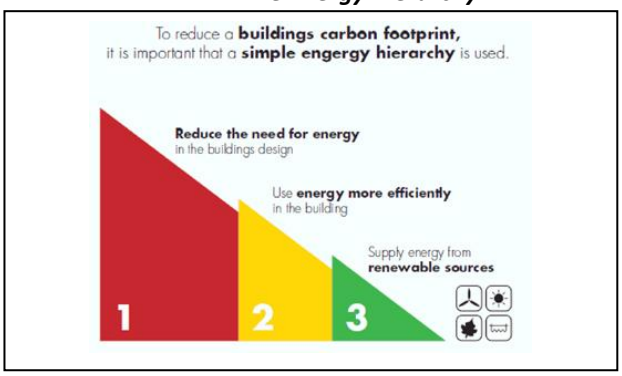
Environmental Impact (EI) rating is an indication of CO_2 emissions produced by heating and lighting, the higher the rating the lower the Carbon emissions will be.

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.

The Energy Hierarchy



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 CO_2 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 W/(m²·K)
Party walls	U = 0
Floors	U = 0.13 W/(m²·K)
Roofs	U = 0.11 W/(m²·K)
Opaque door (less than 30% glazed area)	U = 1.0 W/(m²·K)
Semi-glazed door (30–60% glazed area)	U = 1.0 W/(m²·K)
Windows and glazed doors with greater than 60% glazed area	U = 1.2 W/(m²·K) Frame factor = 0.7
Roof windows	U = 1.2 W/(m²·K), when in vertical position (for correction due to angle, see specification in SAP 10 Appendix R)
Rooflights	U = 1.7 W/(m²·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 m³/(h·m²) 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 x (0.2 + 0.051 $V^{2/3}$) kWh/day where V is the volume of the cylinder in litres
Lighting	Fixed lighting capacity (lm) = 185 x 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 x 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

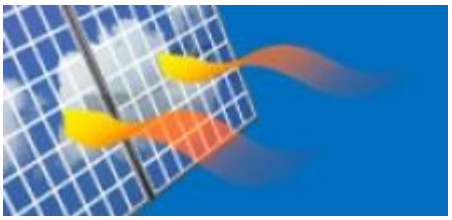
Low carbon technologies

- 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 bi 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 C02 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.

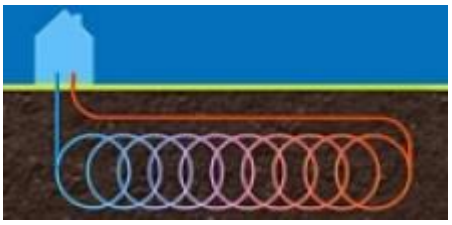
Ground source heat pumps

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

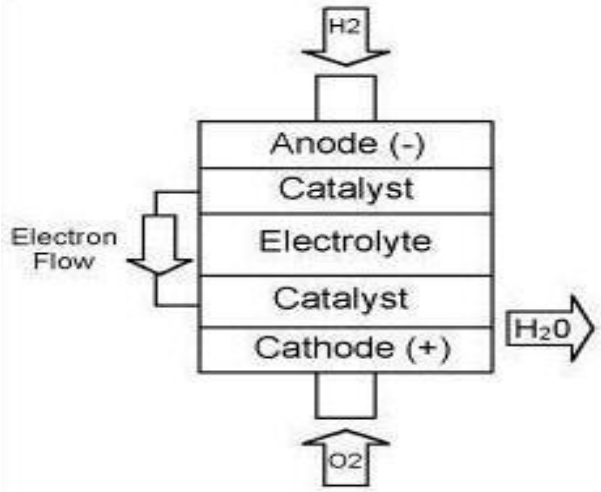
Biogas typically refers to a gas produced by the biological breakdown of organic matter in the absence of oxygen. Biogas originates from biogenic material and is a type of bio fuel. One type of biogas is produced by anaerobic digestion or fermentation of biodegradable materials such as biomass, manure 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 LZC technologies; in reality they provide a large reduction in both CO_2 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 CO_2 emissions compared to some technologies that are classified and listed as LZC technologies yet do not provide a reduction in CO_2 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 the 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)

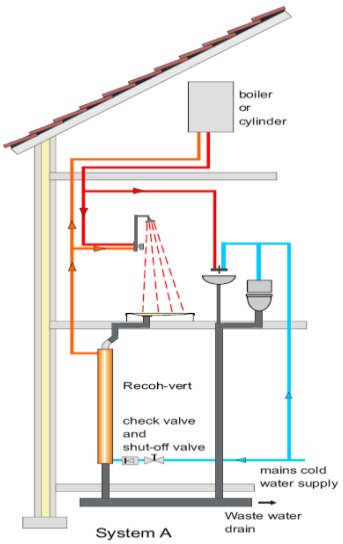


Figure 1

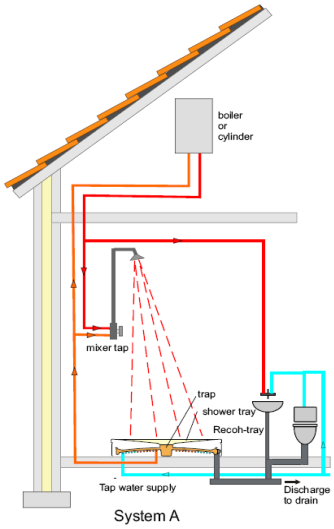


Figure 2

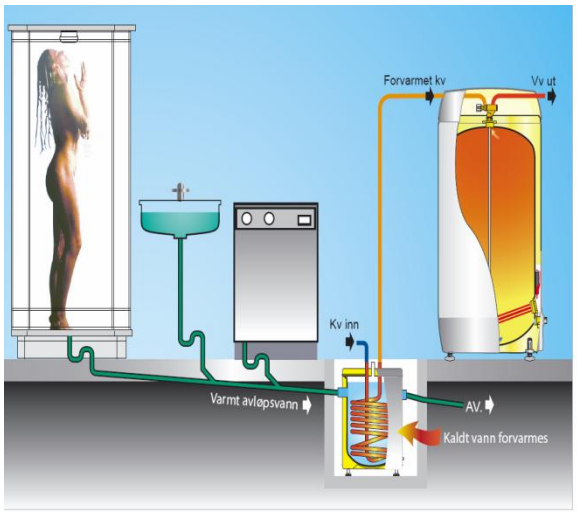


Figure 3

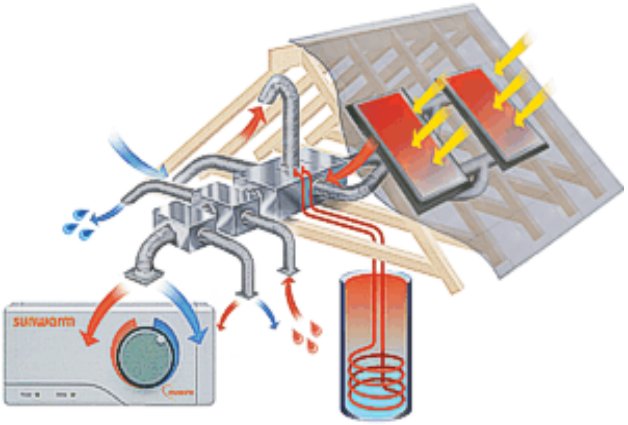
Shower Saver (figure 1 & 2)

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 Recoh-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/ CO_2 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.

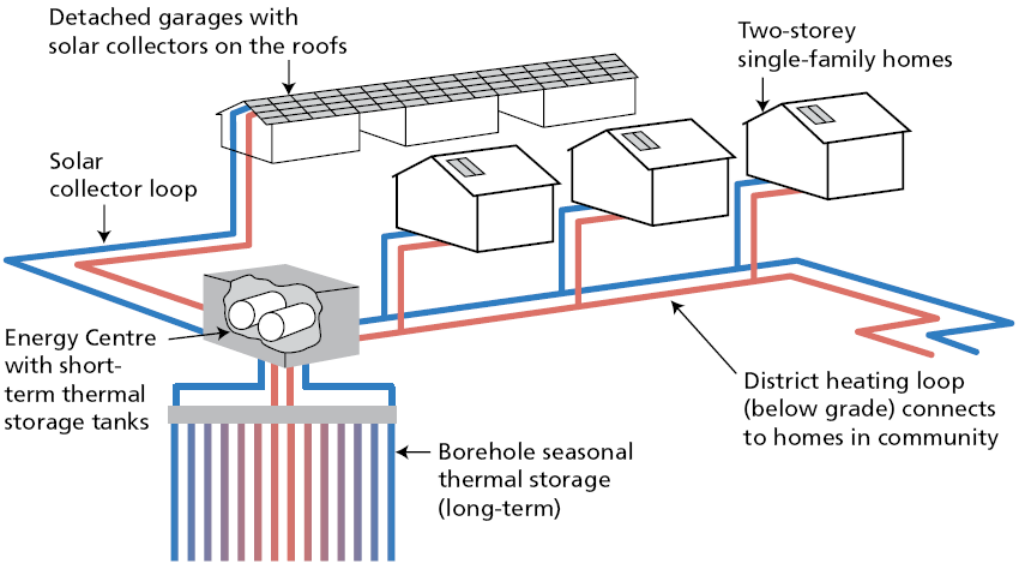
The Sunwarm system is a system that uses solar radiation in the same way Solar thermal uses solar radiation to heat water, the Sunwarm system uses solar radiation to heat air which is then introduced through the ventilation ducting and into the dwelling, the Sunwarm system can also be used to heat water 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 approximatley1500 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 Geothermic Storage

Solar Seasonal Storage and District Loop



Geothermic 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.

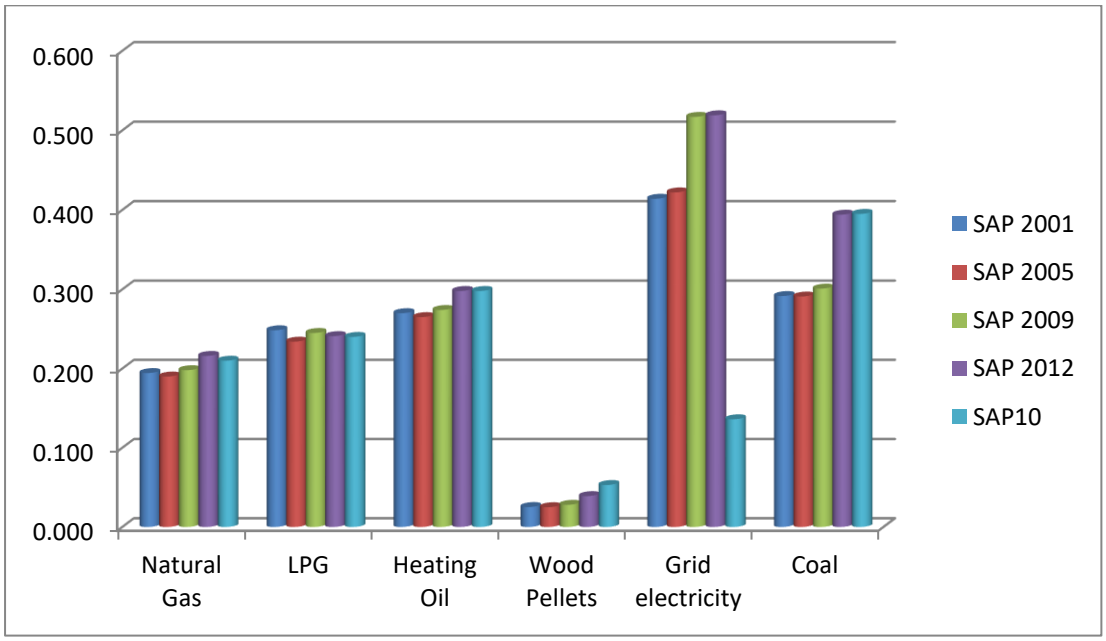
Currently there is no way of assessing the benefit of the Geothermic storage system because of limited test data and therefore the system has not been considered further in this study.

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

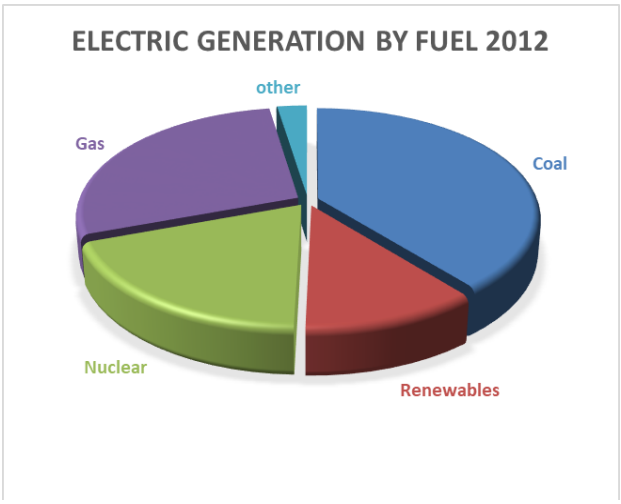
6 Fuel Cost and Carbon

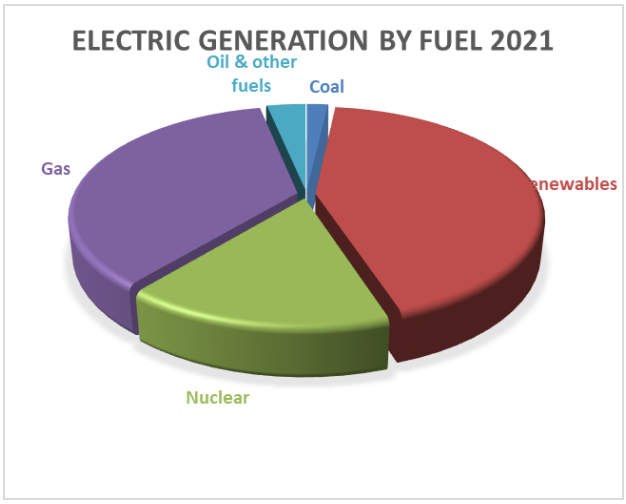
Carbon

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

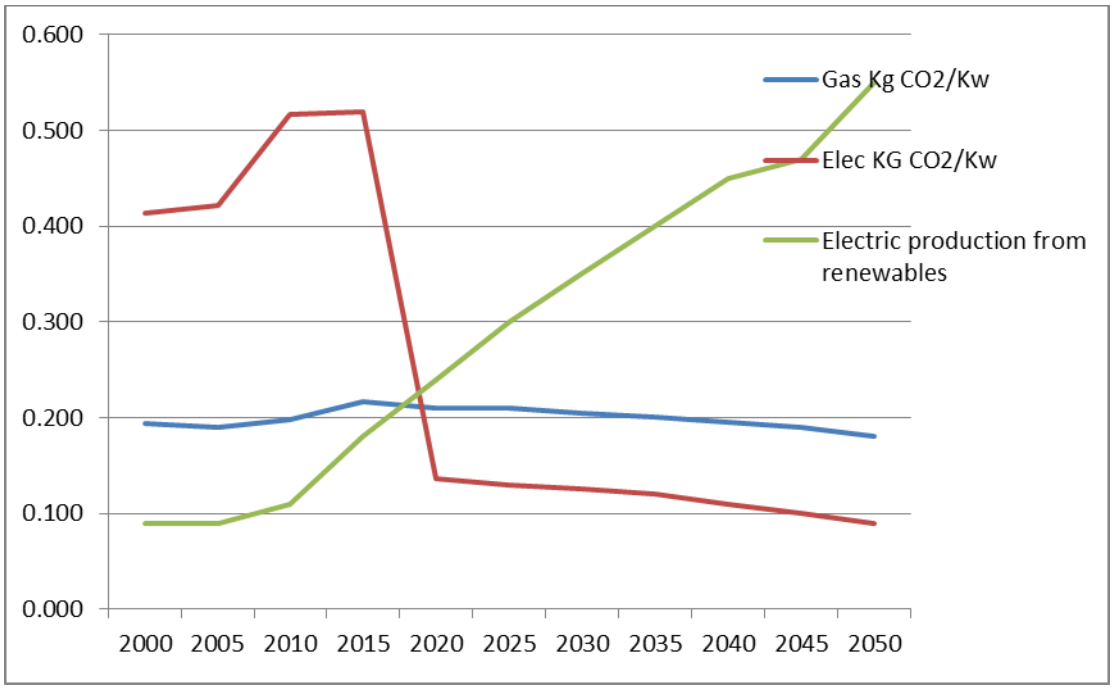


It can be seen that electric generation from renewable technologies has increased as well as a marked reduction in generation from coal however as a consequence the share of electric production from gas has also increased.



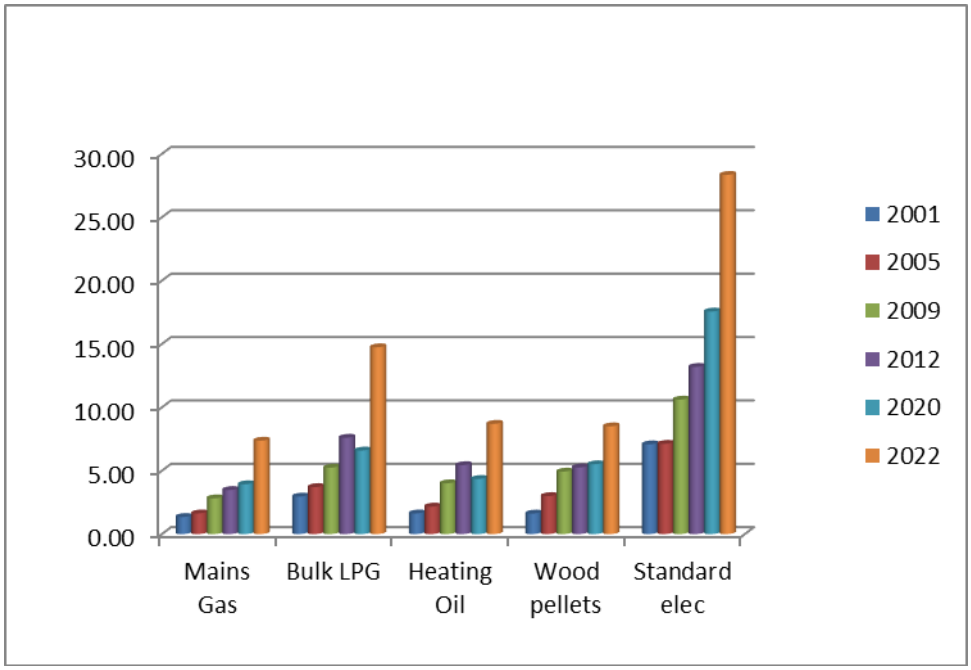


The following graph represents an estimate of CO2 emissions for both gas and electricity and how they may change over the following years; data has been taken from SAP 2001, 2005, 2009, 2012 and SAP10.1 documents.



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

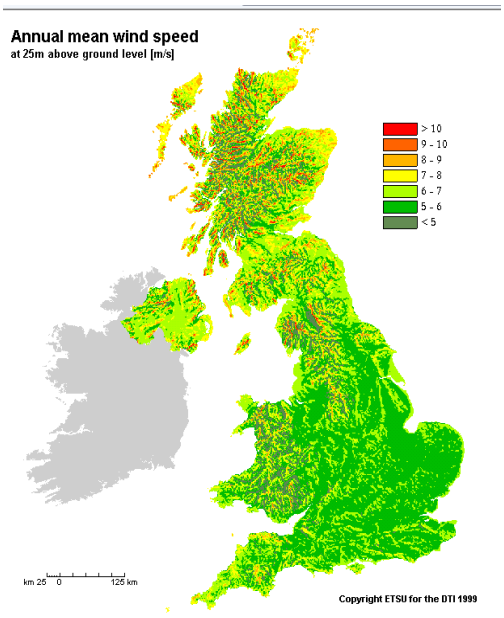
Low or Zero Carbon technologies and other innovative technologies not thought appropriate for use at the proposed development**.**

- 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 an 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 (PM_{10}/$PM_{2.5}$) 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 CO_2 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 one 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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	61.8300 (1b)	x	2.3100 (2b)	=	142.8273	(1b) - (3b)
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	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2000	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1700	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998	(22b)

Mechanical extract ventilation - 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 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								
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, m2)			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/m2K		180.3474 (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	0.1000	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 (36a) = 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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	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)
Heat transfer coeff	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)
Average = Sum(39)m / 12 =												61.2108	

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

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	0.0000	(59)
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	(61)
Total heat required for water heating calculated for each month	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)
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	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)
										Total per year (kWh/year) = Sum(64)m =		1834.9641	(64)
12Total per year (kWh/year)												1835	(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	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)

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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	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)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
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	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, ni1,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)

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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												76.2000	(216)
(217)m	83.3690	82.7211	81.7074	80.0472	77.9329	76.2000	76.2000	76.2000	76.2000	80.1318	82.5298	83.5741	(217)
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)

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						
Ground floor	61.8300	(1b) x	2.3100	(2b) =	142.8273	(1b) - (3b)
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)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1400	(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)

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			12.5100	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

	Length	Psi-value	Total
K1 Element			
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	(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	

	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	(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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	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)
										Total per year (kWh/year) = Sum(64)m =		2168.0203	(64)
12Total per year (kWh/year)												2168	(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	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)

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	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) =		0.3087	(91)
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 m2										(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)	369.6595	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												80.3000	(216)
(217)m	85.3906	84.9521	84.2399	82.9821	81.4986	80.3000	80.3000	80.3000	80.3000	83.0254	84.7232	85.4828	(217)
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)													

(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)

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 FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	61.8300 (1b)	x	2.3100 (2b)	=	142.8273	(1b) - (3b)
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)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1400	(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 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								
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, m2)			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/m2K		190.3474 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
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 (36a) = 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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	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)
Heat transfer coeff	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)
Average = Sum(39)m / 12 =												63.5924	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	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)
HLP (average)												1.0285	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0329 (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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	(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)
										Total per year (kWh/year) = Sum(64)m =		784.6995	(64)
12Total per year (kWh/year)												785	(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)

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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	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)

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6. Solar gains

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

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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	50.7555	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) =			0.3087	(91)
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) =		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	46.0140	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							
Ground floor		61.8300 (1b)	x	2.3100 (2b)	=	142.8273 (1b) - (3b)	
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)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1400 (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)
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	0.5893	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

	Length	Psi-value	Total
K1 Element			
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	(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	

	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	(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)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	(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)
										Total per year (kWh/year) = Sum(64)m =		784.6995	(64)
12Total per year (kWh/year)												785	(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)

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)

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6. Solar gains

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

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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	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										fLA = Living area / (4) =		0.3087	(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)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	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											(98c) / (4) =	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										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	50.6809	64.9190	54.3306	0.0000	0.0000	0.0000	0.0000	(107)
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)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	61.8300 (1b)	x	2.3100 (2b)	=	142.8273	(1b) - (3b)
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	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2000	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1700	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998	(22b)

Mechanical extract ventilation - 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 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								
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, m2)			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/m2K		180.3474 (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	0.1000	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 (36a) = 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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	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)
Heat transfer coeff	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)
Average = Sum(39)m / 12 =												61.2108	

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

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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	0.0000	(59)
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	(61)
Total heat required for water heating calculated for each month	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)
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	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)
										Total per year (kWh/year) = Sum(64)m =		1834.9641	(64)
12Total per year (kWh/year)												1835	(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	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)

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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	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)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
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	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, ni1,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)

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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												76.2000	(216)
(217)m	83.3690	82.7211	81.7074	80.0472	77.9329	76.2000	76.2000	76.2000	76.2000	80.1318	82.5298	83.5741	(217)
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)

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						
Ground floor	61.8300	(1b) x	2.3100	(2b) =	142.8273	(1b) - (3b)
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)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1400	(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)

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			12.5100	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

	Length	Psi-value	Total
K1 Element			
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	(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	

	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	(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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	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)
										Total per year (kWh/year) = Sum(64)m =		2168.0203	(64)
12Total per year (kWh/year)												2168	(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	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)

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	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) =		0.3087	(91)
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 m2										(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)	369.6595	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												80.3000	(216)
(217)m	85.3906	84.9521	84.2399	82.9821	81.4986	80.3000	80.3000	80.3000	80.3000	83.0254	84.7232	85.4828	(217)
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)													

(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

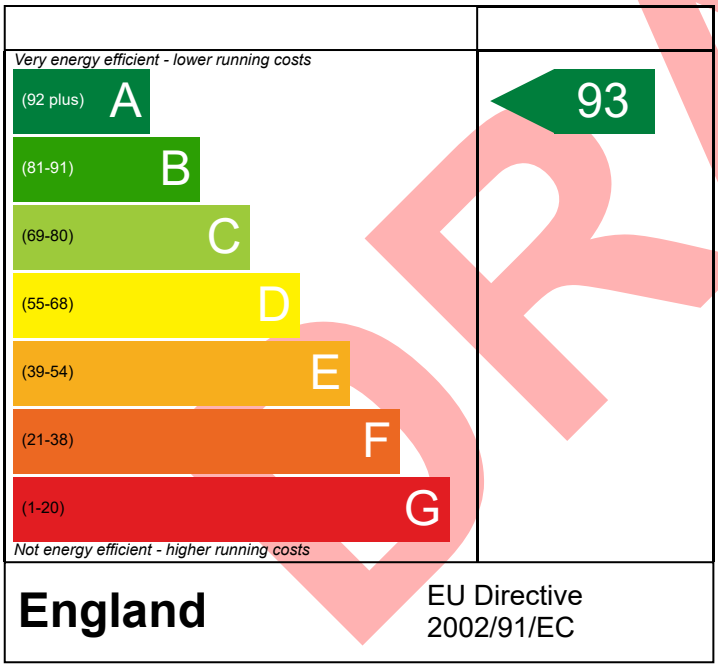
Highmoor Lane, CLECKHEATON, BD19 6LW

Dwelling type:	Flat, Semi-Detached
Date of assessment:	07/05/2025
Produced by:	Paul Goddard
Total floor area:	61.83 m²
DRRN:	

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.

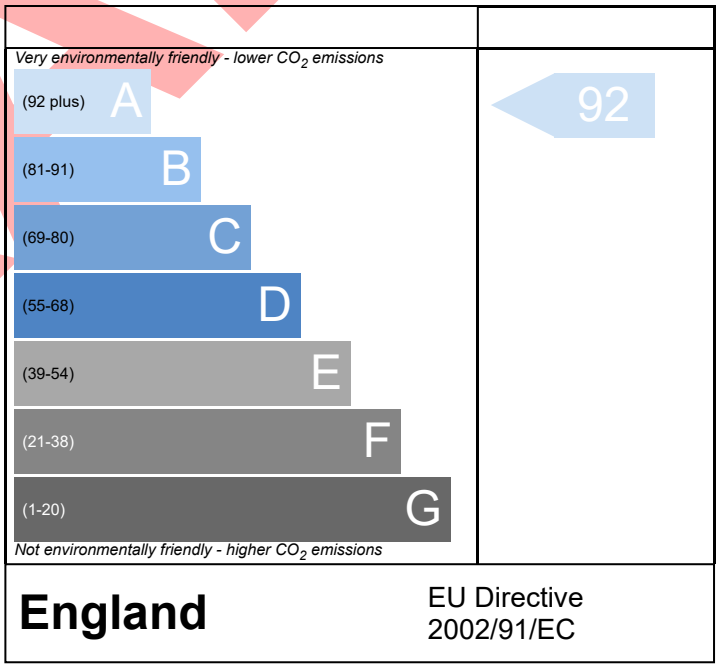
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.

Energy Efficiency 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.

Environmental Impact (CO_2) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

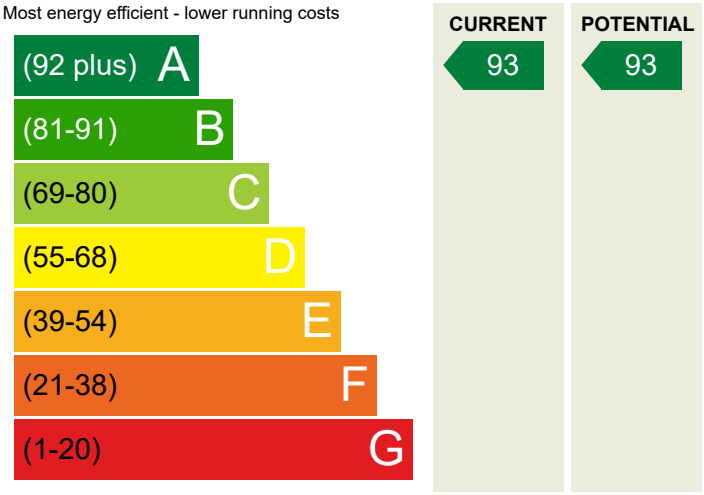
Energy Report

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

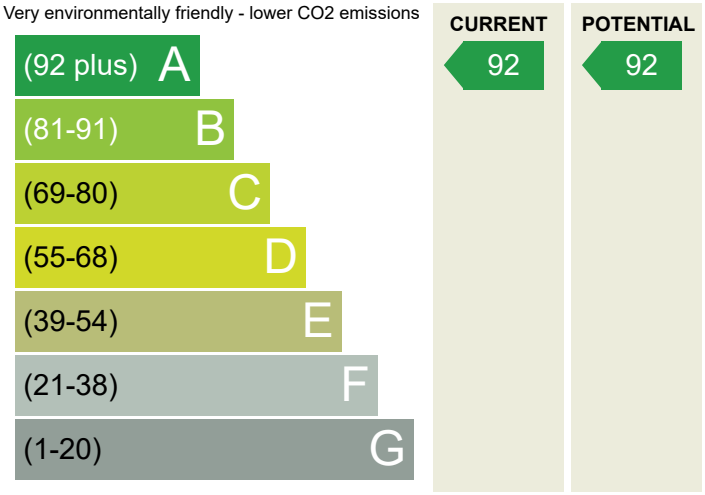
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

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

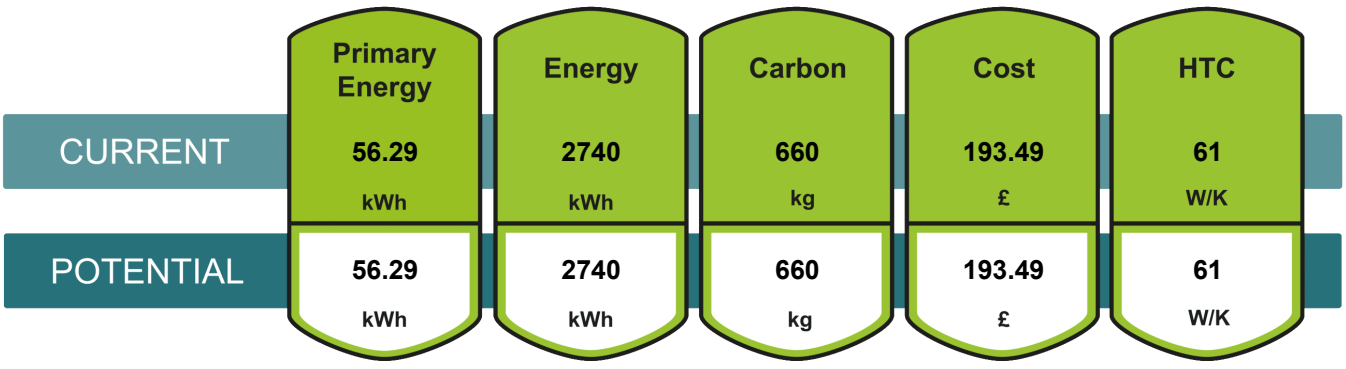
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

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/m²K	Very Good
Floor	Average thermal transmittance 0.11 W/m²K	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 m³/h.m² (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

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.

Energy Report

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

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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)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2000	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1700	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998	(22b)

Mechanical extract ventilation - 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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
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, m2)			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/m2K 172.0799 (35)
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 (36a) = 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	28.2556	28.2556	28.2556	28.2556	28.2556	28.2556	28.2556	28.2556	28.2556	28.2556	28.2556	28.2556	(38)
Heat transfer coeff	72.7830	72.7830	72.7830	72.7830	72.7830	72.7830	72.7830	72.7830	72.7830	72.7830	72.7830	72.7830	(39)
Average = Sum(39)m / 12 =												72.7830	
HLP	0.9929	0.9929	0.9929	0.9929	0.9929	0.9929	0.9929	0.9929	0.9929	0.9929	0.9929	0.9929	(40)
HLP (average)												0.9929	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3235 (42)
Hot water usage for mixer showers

63.1772	62.2278	60.8442	58.1972	56.2437	54.0652	52.8269	54.1999	55.7050	58.0441	60.7480	62.9351	(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) 118.4826 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	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 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	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	1.7032	1.5531	1.7014	1.5428	1.5334	1.4114	1.3909	1.4179	1.4024	1.5235	1.5684	1.6869	(61)
Total heat required for water heating calculated for each month	205.8393	181.1771	190.4252	162.6591	154.3997	135.5687	131.2755	138.5270	142.2857	162.9004	178.3687	202.9798	(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	205.8393	181.1771	190.4252	162.6591	154.3997	135.5687	131.2755	138.5270	142.2857	162.9004	178.3687	202.9798	(64)
									Total per year (kWh/year) = Sum(64)m =			1986.4061	(64)
12Total per year (kWh/year)												1986	(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	68.3011	60.1133	63.1760	53.9569	51.2114	44.9602	43.5344	45.9433	47.1943	54.0387	59.1782	67.3516	(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	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	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	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)	-92.9401	-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)	91.8025	89.4543	84.9140	74.9401	68.8325	62.4447	58.5139	61.7517	65.5476	72.6326	82.1919	90.5264	(72)
Total internal gains	463.8934	475.0674	453.7736	435.9401	411.8901	392.5168	376.0010	377.1128	389.8116	407.7561	435.2578	453.5778	(73)

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6. Solar gains

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

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, ni1,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	16.4000	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												76.2000	(216)
(217)m	83.7996	83.2625	82.3964	80.8960	78.6562	76.2000	76.2000	76.2000	76.2000	80.8586	83.0479	83.9794	(217)
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:

(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)

	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													
	0.4608	0.4518	0.4427	0.3975	0.3885	0.3433	0.3433	0.3343	0.3614	0.3885	0.4066	0.4247	(22b)
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	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	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

	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	0.1600	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

63.1772	62.2278	60.8442	58.1972	56.2437	54.0652	52.8269	54.1999	55.7050	58.0441	60.7480	62.9351	(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) 118.4826 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	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 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	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)
									Total per year (kWh/year) = Sum(64)m =			2299.6116	(64)
12Total per year (kWh/year)												2300	(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

	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													

	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	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)												
	-92.9401	-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)												
	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)
Total internal gains												
	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										fLA = Living area / (4) =		0.2604 (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												0.0000
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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	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)
Useful gains	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)
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	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 kWh	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)
Space heating requirement - total per year (kWh/year)												2022.9081	
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	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)												2022.9081	
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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	423.3516	314.7066	252.9577	131.7617	52.9161	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													
Water heating requirement	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)
Efficiency of water heater												80.3000	(216)
(217)m	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)
Fuel for water heating, kWh/month	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)
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	22.1006	17.7299	15.9638	11.6958	9.0341	7.3810	8.2412	10.7123	13.9142	18.2562	20.6203	22.7148	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													

(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)

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 FABRIC ENERGY EFFICIENCY

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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		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 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								
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, m2)			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/m2K		172.0799 (35)

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 (36a) = 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

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

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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)

	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	(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)
12Total per year (kWh/year) 850 (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)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 575.5083 (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)

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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	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

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)

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6. Solar gains

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

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)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	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										fLA = Living area / (4) =		0.2604	(91)
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	(92)
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)

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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											(98c) / (4) =	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

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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)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)

Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	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)

	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													
	0.4608	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)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(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	(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	(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)

12Total per year (kWh/year) 850 (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)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 575.5083 (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

	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

	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	0.6300	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) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	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	0.9838	0.9686	0.9418	0.8742	0.7552	0.5802	0.4329	0.4771	0.6993	0.9024	0.9700	0.9865	(86)
MIT	19.4062	19.6744	20.0186	20.4535	20.7708	20.9415	20.9858	20.9792	20.8745	20.4559	19.8639	19.3673	(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	0.9802	0.9618	0.9291	0.8472	0.7055	0.5055	0.3428	0.3842	0.6280	0.8753	0.9623	0.9835	(89)
MIT 2	18.5699	18.8354	19.1724	19.5923	19.8728	20.0120	20.0377	20.0369	19.9654	19.6054	19.0340	18.5390	(90)
Living area fraction									fLA = Living area / (4) =			0.2604	(91)
MIT	18.7877	19.0539	19.3927	19.8166	20.1067	20.2541	20.2846	20.2823	20.2022	19.8269	19.2501	18.7548	(92)
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	18.7548	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9742	0.9534	0.9192	0.8404	0.7096	0.5227	0.3660	0.4079	0.6411	0.8686	0.9545	0.9782	(94)
Useful gains	515.4027	596.0908	634.5624	642.7371	571.6864	416.9378	280.1367	292.8892	430.8516	515.0870	505.7205	491.8668	(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	1152.9357	1123.0765	1020.0620	852.0032	654.4269	434.8631	283.3915	297.9203	471.5233	718.2742	950.7706	1145.1125	(97)
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	486.0148	(98a)
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	0.0000	(98b)
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	486.0148	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2285.1234	
Space heating per m2											(98c) / (4) =	31.1749	(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	722.9691	569.1459	583.2134	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8750	0.9256	0.9056	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	632.5891	526.7937	528.1332	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	889.8196	854.2020	800.8985	0.0000	0.0000	0.0000	0.0000	(103)
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	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	46.3015	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

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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)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2000	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1700	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998	(22b)

Mechanical extract ventilation - 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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
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, m2)			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/m2K 172.0799 (35)
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 (36a) = 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	28.2556	28.2556	28.2556	28.2556	28.2556	28.2556	28.2556	28.2556	28.2556	28.2556	28.2556	28.2556	(38)
Heat transfer coeff	72.7830	72.7830	72.7830	72.7830	72.7830	72.7830	72.7830	72.7830	72.7830	72.7830	72.7830	72.7830	(39)
Average = Sum(39)m / 12 =												72.7830	
HLP	0.9929	0.9929	0.9929	0.9929	0.9929	0.9929	0.9929	0.9929	0.9929	0.9929	0.9929	0.9929	(40)
HLP (average)												0.9929	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3235 (42)
Hot water usage for mixer showers

63.1772	62.2278	60.8442	58.1972	56.2437	54.0652	52.8269	54.1999	55.7050	58.0441	60.7480	62.9351	(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) 118.4826 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	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 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	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	1.7032	1.5531	1.7014	1.5428	1.5334	1.4114	1.3909	1.4179	1.4024	1.5235	1.5684	1.6869	(61)
Total heat required for water heating calculated for each month	205.8393	181.1771	190.4252	162.6591	154.3997	135.5687	131.2755	138.5270	142.2857	162.9004	178.3687	202.9798	(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	205.8393	181.1771	190.4252	162.6591	154.3997	135.5687	131.2755	138.5270	142.2857	162.9004	178.3687	202.9798	(64)
									Total per year (kWh/year) = Sum(64)m =			1986.4061	(64)
12Total per year (kWh/year)												1986	(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	68.3011	60.1133	63.1760	53.9569	51.2114	44.9602	43.5344	45.9433	47.1943	54.0387	59.1782	67.3516	(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	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	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	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)	-92.9401	-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)	91.8025	89.4543	84.9140	74.9401	68.8325	62.4447	58.5139	61.7517	65.5476	72.6326	82.1919	90.5264	(72)
Total internal gains	463.8934	475.0674	453.7736	435.9401	411.8901	392.5168	376.0010	377.1128	389.8116	407.7561	435.2578	453.5778	(73)

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6. Solar gains

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

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, ni1,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	16.4000	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												76.2000	(216)
(217)m	83.7996	83.2625	82.3964	80.8960	78.6562	76.2000	76.2000	76.2000	76.2000	80.8586	83.0479	83.9794	(217)
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:

(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)

	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													
	0.4608	0.4518	0.4427	0.3975	0.3885	0.3433	0.3433	0.3343	0.3614	0.3885	0.4066	0.4247	(22b)
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	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	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

	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	0.1600	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

63.1772	62.2278	60.8442	58.1972	56.2437	54.0652	52.8269	54.1999	55.7050	58.0441	60.7480	62.9351	(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) 118.4826 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	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 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	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)
									Total per year (kWh/year) = Sum(64)m =			2299.6116	(64)
12Total per year (kWh/year)												2300	(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

	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													

	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	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)												
	-92.9401	-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)												
	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)
Total internal gains												
	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										fLA = Living area / (4) =		0.2604 (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												0.0000
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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	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)
Useful gains	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)
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	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 kWh	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)
Space heating requirement - total per year (kWh/year)												2022.9081	
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	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)												2022.9081	
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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	423.3516	314.7066	252.9577	131.7617	52.9161	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													
Water heating requirement	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)
Efficiency of water heater												80.3000	(216)
(217)m	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)
Fuel for water heating, kWh/month	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)
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	22.1006	17.7299	15.9638	11.6958	9.0341	7.3810	8.2412	10.7123	13.9142	18.2562	20.6203	22.7148	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													

(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

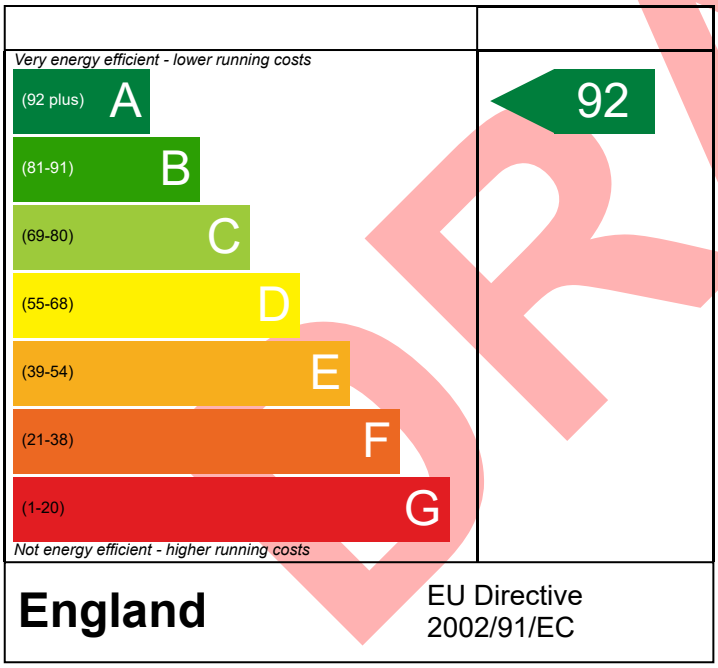
Highmoor Lane, CLECKHEATON, BD19 6LW

Dwelling type:	Flat, Semi-Detached
Date of assessment:	07/05/2025
Produced by:	Paul Goddard
Total floor area:	73.3 m²
DRRN:	

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.

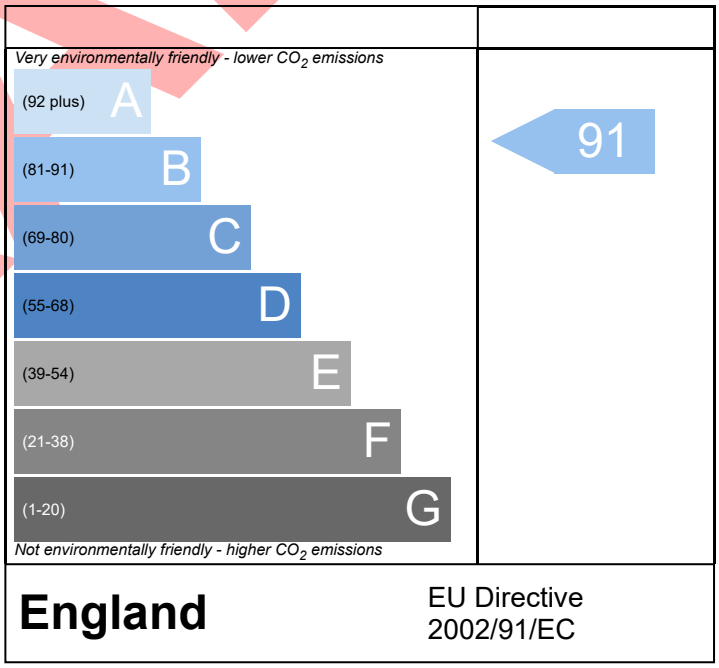
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.

Energy Efficiency 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.

Environmental Impact (CO_2) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

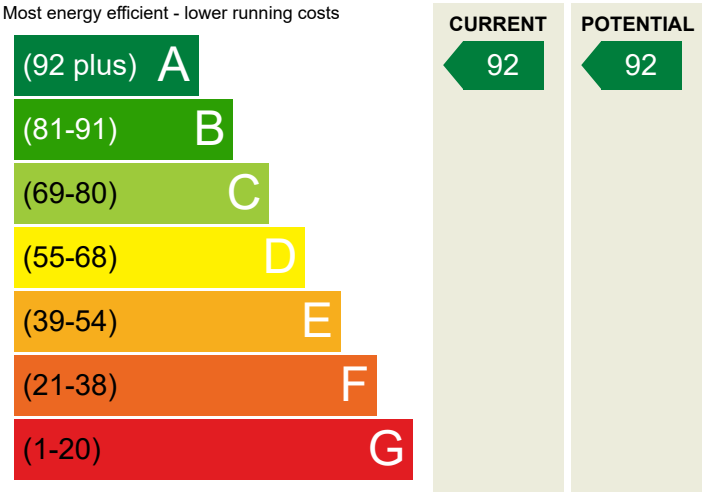
Energy Report

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

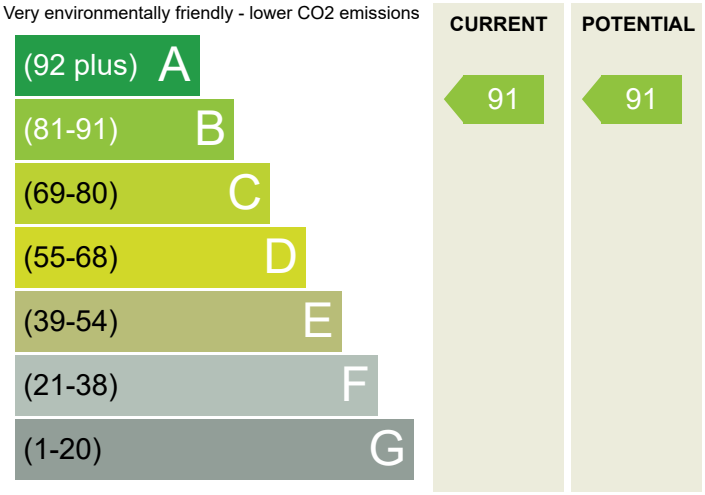
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

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

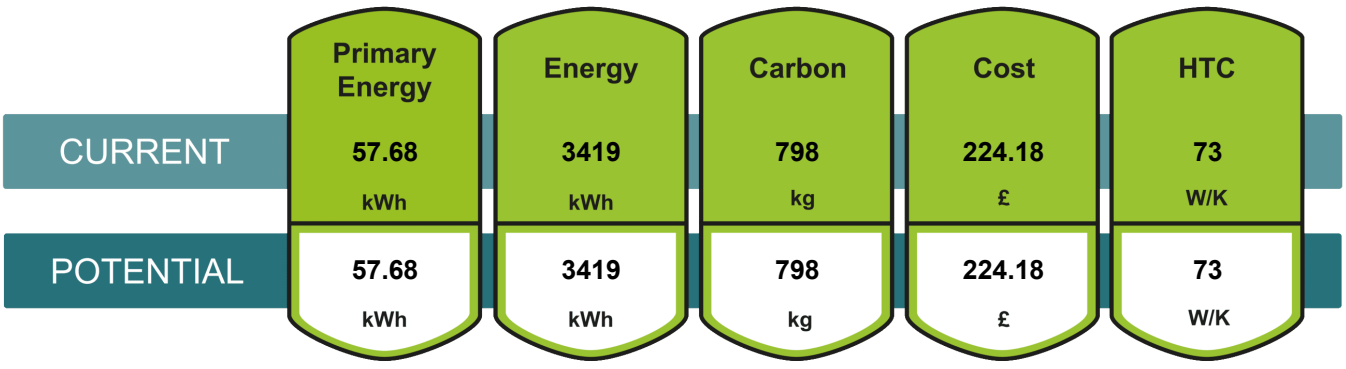
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

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/m²K	Very Good
Roof	Average thermal transmittance 0.09 W/m²K	Very Good
Floor	Average thermal transmittance 0.11 W/m²K	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 m³/h.m² (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

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.

Energy Report

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

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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	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2000	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1700	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998	(22b)

Mechanical extract ventilation - 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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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 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								
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, m2)			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/m2K 208.0441 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
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	0.1000	0.9490
E6 Intermediate floor within a dwelling	9.4900	0.0700	0.6643
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) 8.4415 (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	(38)
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	(39)
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	(40)
HLP (average)												0.9113	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3131 (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)

	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	(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	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)
										Total per year (kWh/year) = Sum(64)m =		1980.9665	(64)
12Total per year (kWh/year)												1981	(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)

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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	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	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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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	(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)

Solar gains	51.2826	100.3197	165.2123	240.9522	295.2960	302.2880	287.7905	247.2078	192.1487	119.0378	63.9434	42.1723	(83)
Total gains	518.5229	579.2434	622.3679	680.5195	710.7433	698.6080	667.4916	628.0226	585.7846	530.3810	502.8489	499.1463	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	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)

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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												76.2000	(216)
(217)m	83.5871	83.1028	82.2035	80.4807	78.0760	76.2000	76.2000	76.2000	76.2000	80.6009	82.8328	83.7600	(217)
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	241.6720	(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	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)													
(233a)m	-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)													
(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	-9.0961	-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)													
(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												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)

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)
	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)

	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													
	0.4460	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)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	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)
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	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	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)
HLP (average)												0.9919	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3131	(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)

	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	(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	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													
	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	-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													
	225.7267	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) = Sum(64)m =		2294.8958	(64)
12Total per year (kWh/year)												2295	(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													
	80.4266	71.0661	75.3163	65.7513	63.4267	56.8123	55.8065	58.2020	59.0425	66.2487	70.9517	79.4839	(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	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-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

	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)

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6. Solar gains

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

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	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									fLA = Living area / (4) =			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												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)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	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 m2											(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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	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												80.3000	(216)
(217)m	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)
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	-29.5381	(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	-19.1566	-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)

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 FABRIC ENERGY EFFICIENCY

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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)

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2. Ventilation rate

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

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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								
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, m2)			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/m2K							208.0441	(35)
List of Thermal Bridges								

	Length	Psi-value	Total	
K1 Element				
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	0.1000	0.9490	
E6 Intermediate floor within a dwelling	9.4900	0.0700	0.6643	
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)			8.4415	(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	35.3518	35.1691	34.9901	34.1490	33.9917	33.2592	33.2592	33.1235	33.5413	33.9917	34.3100	34.6428	(38)
Heat transfer coeff	71.0807	70.8980	70.7189	69.8779	69.7205	68.9880	68.9880	68.8524	69.2702	69.7205	70.0389	70.3717	(39)
Average = Sum(39)m / 12 =												69.8771	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9758	0.9733	0.9709	0.9593	0.9572	0.9471	0.9471	0.9453	0.9510	0.9572	0.9615	0.9661	(40)
HLP (average)												0.9593	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3131 (42)

Hot water usage for mixer showers

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

27.2161	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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	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 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

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

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)
							Total per year (kWh/year) = Sum(64)m =				847.9632	(64)
12Total per year (kWh/year)											848	(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)

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6. Solar gains

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

Solar gains	51.2826	100.3197	165.2123	240.9522	295.2960	302.2880	287.7905	247.2078	192.1487	119.0378	63.9434	42.1723	(83)
Total gains	470.5704	532.4593	578.2999	643.0226	677.1111	672.0611	643.7427	602.4144	557.9307	494.9728	461.1704	452.0885	(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	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										fLA = Living area / (4) =		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) =		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	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

	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)

		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)

	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	0.4460	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	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	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)
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	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	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)
HLP (average)												0.9919	
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	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

27.2161	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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	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 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

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

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)

Total per year (kWh/year) = Sum(64)m =	847.9632	(64)
12Total per year (kWh/year)	848	(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)

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	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	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) =		0.1922	(91)
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) =		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	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)

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

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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	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2000	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1700	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998	(22b)

Mechanical extract ventilation - 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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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 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								
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, m2)			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/m2K 208.0441 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
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	0.1000	0.9490
E6 Intermediate floor within a dwelling	9.4900	0.0700	0.6643
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) 8.4415 (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	(38)
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	(39)
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	(40)
HLP (average)												0.9113	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3131 (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)

	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	(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	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)
										Total per year (kWh/year) = Sum(64)m =		1980.9665	(64)
12Total per year (kWh/year)												1981	(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)

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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	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	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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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	(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)

Solar gains	51.2826	100.3197	165.2123	240.9522	295.2960	302.2880	287.7905	247.2078	192.1487	119.0378	63.9434	42.1723	(83)
Total gains	518.5229	579.2434	622.3679	680.5195	710.7433	698.6080	667.4916	628.0226	585.7846	530.3810	502.8489	499.1463	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	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)

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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												76.2000	(216)
(217)m	83.5871	83.1028	82.2035	80.4807	78.0760	76.2000	76.2000	76.2000	76.2000	80.6009	82.8328	83.7600	(217)
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	241.6720	(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	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)													
(233a)m	-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)													
(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	-9.0961	-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)													
(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												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)

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)
	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)

	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													
	0.4460	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)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	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)
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	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	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)
HLP (average)												0.9919	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3131	(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)

	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	(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	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													
	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	-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													
	225.7267	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) = Sum(64)m =		2294.8958	(64)
12Total per year (kWh/year)												2295	(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													
	80.4266	71.0661	75.3163	65.7513	63.4267	56.8123	55.8065	58.2020	59.0425	66.2487	70.9517	79.4839	(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	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-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

	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)

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6. Solar gains

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

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	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									fLA = Living area / (4) =			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												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)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	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 m2											(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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	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												80.3000	(216)
(217)m	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)
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	-29.5381	(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	-19.1566	-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

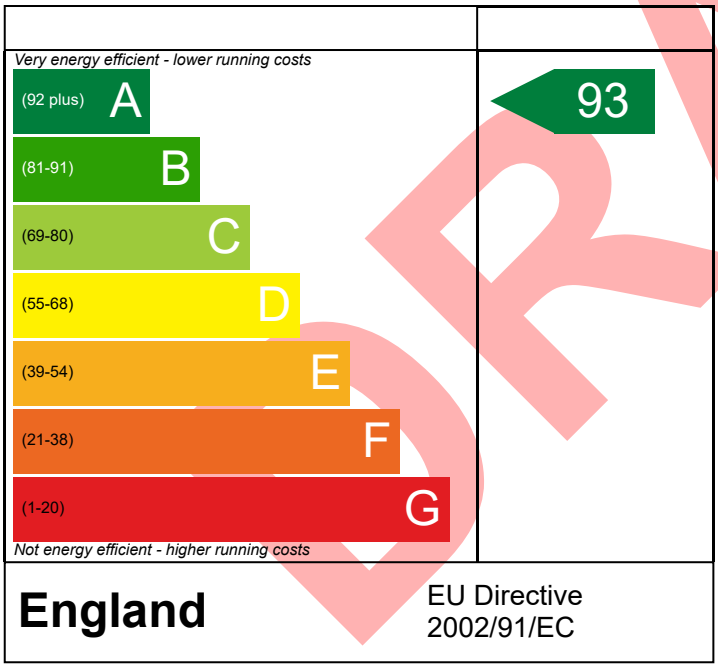
Highmoor Lane, CLECKHEATON, BD19 6LW

Dwelling type:	House, Mid-Terrace
Date of assessment:	07/05/2025
Produced by:	Paul Goddard
Total floor area:	72.84 m²
DRRN:	

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.

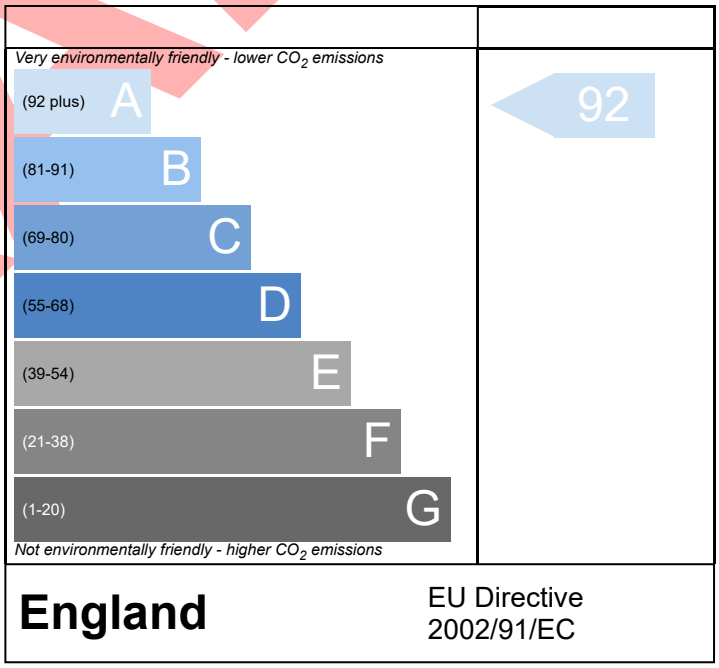
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.

Energy Efficiency 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.

Environmental Impact (CO_2) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

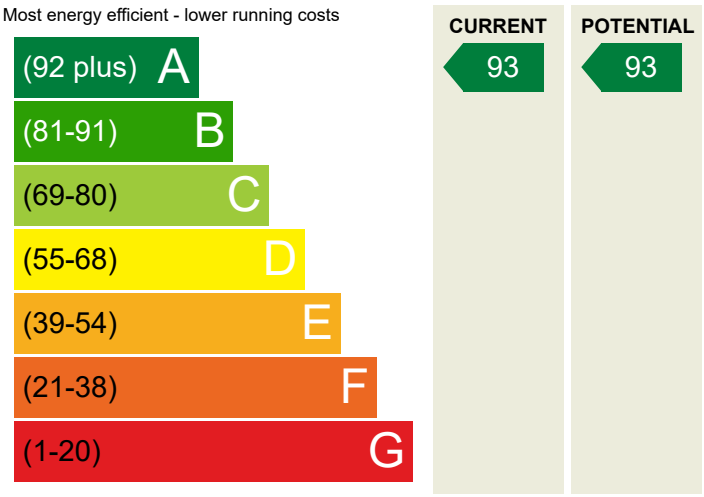
Energy Report

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

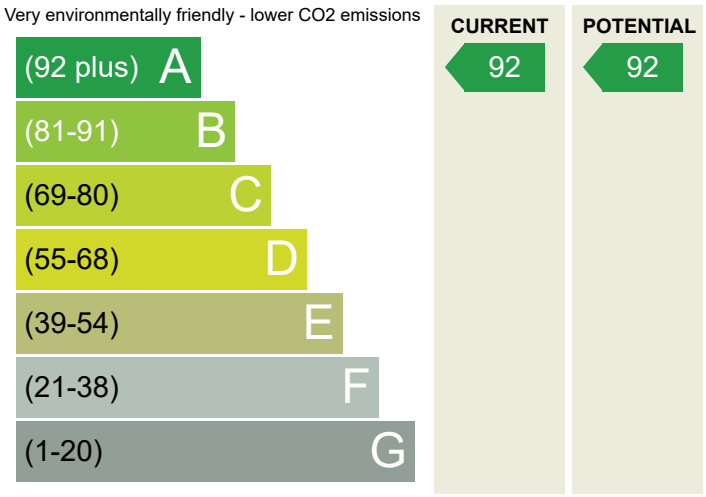
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

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

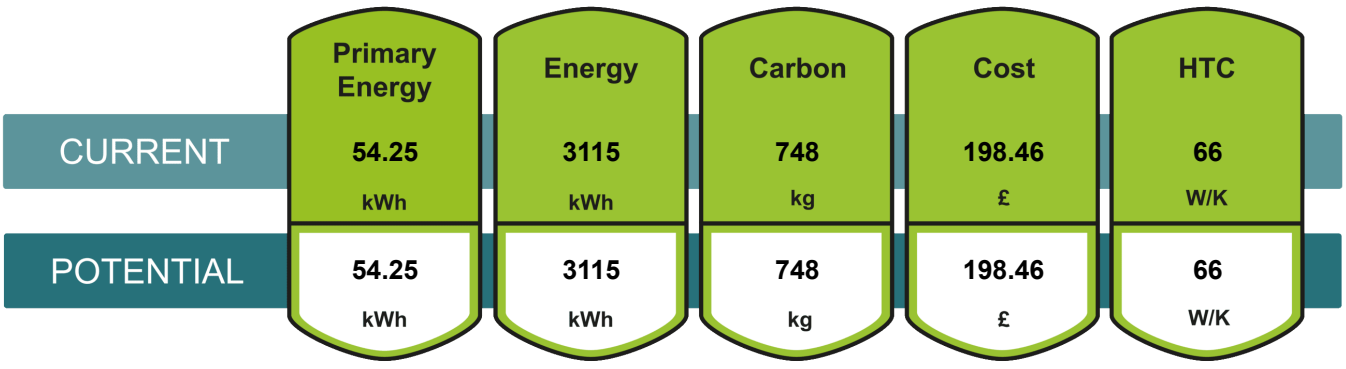
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

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/m²K	Very Good
Roof	Average thermal transmittance 0.09 W/m²K	Very Good
Floor	Average thermal transmittance 0.1 W/m²K	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 m³/h.m² (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.

Energy Report

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

Energy Report

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-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

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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	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2000	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1700	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998	(22b)

Mechanical extract ventilation - 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 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								
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, m2)			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/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)

	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	(38)
Heat transfer coeff	76.1323	76.1323	76.1323	76.1323	76.1323	76.1323	76.1323	76.1323	76.1323	76.1323	76.1323	76.1323	(39)

Average = Sum(39)m / 12 = 76.1323

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0452	1.0452	1.0452	1.0452	1.0452	1.0452	1.0452	1.0452	1.0452	1.0452	1.0452	1.0452	(40)
HLP (average)												1.0452	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3131 (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)

	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	(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	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)
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)
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)

Primary loss, Combi loss

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)
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)
-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)
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)
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)

WWHRS, PV diverter, Solar input, FGHRS

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)

Total per year (kWh/year) = Sum(64)m = 1980.9665 (64)

12Total per year (kWh/year) 1981 (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)

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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	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)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.5000	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)

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)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	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) =		0.1922	(91)
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												-0.1500	
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)

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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												76.2000	(216)
(217)m	84.2318	83.8429	83.0833	81.5864	79.0904	76.2000	76.2000	76.2000	76.2000	81.6565	83.5967	84.3770	(217)
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:
(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)
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)
	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)

	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	0.4460	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	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	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)
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	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1412	1.1379	1.1348	1.1198	1.1170	1.1040	1.1040	1.1016	1.1090	1.1170	1.1227	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)

	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	(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	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	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	-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	225.7267	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) = Sum(64)m =			2294.8958	(64)
12Total per year (kWh/year)												2295	(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	80.4266	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)

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

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.5000	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)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	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)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	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)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	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												80.3000	(216)
(217)m	85.9669	85.6943	85.1505	84.0099	82.2840	80.3000	80.3000	80.3000	80.3000	84.0554	85.4445	86.0239	(217)
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)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	-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	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	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)

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 FABRIC ENERGY EFFICIENCY

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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)

		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		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 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								
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, m2)			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/m2K							207.1658	(35)
List of Thermal Bridges								

	Length	Psi-value	Total	
K1 Element				
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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.3518	35.1691	34.9901	34.1490	33.9917	33.2592	33.2592	33.1235	33.5413	33.9917	34.3100	34.6428	(38)
Heat transfer coeff	80.8367	80.6540	80.4749	79.6339	79.4765	78.7440	78.7440	78.6084	79.0262	79.4765	79.7949	80.1277	(39)
Average = Sum(39)m / 12 =												79.6331	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1098	1.1073	1.1048	1.0933	1.0911	1.0811	1.0811	1.0792	1.0849	1.0911	1.0955	1.1001	(40)
HLP (average)												1.0933	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3131 (42)

Hot water usage for mixer showers

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

27.2161	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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	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 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													
	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													
	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)
										Total per year (kWh/year) = Sum(64)m =		847.9632	(64)
12Total per year (kWh/year)												848	(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													
	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)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.5000	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)

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	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)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	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										fLA = Living area / (4) =		0.1922	(91)
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)

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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											(98c) / (4) =	36.1560	(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	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

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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)

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2. Ventilation rate

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

Number of intermittent extract fans	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)

	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	0.4460	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	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	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)
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	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1412	1.1379	1.1348	1.1198	1.1170	1.1040	1.1040	1.1016	1.1090	1.1170	1.1227	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	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

27.2161	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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	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 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

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

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)

Total per year (kWh/year) = Sum(64)m =	847.9632 (64)
12Total per year (kWh/year)	848 (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)

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 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	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, ni1,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										fLA = Living area / (4) =		0.1922	(91)
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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	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)
Useful gains	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)
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													
	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 kWh													
	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)
Space heating requirement - total per year (kWh/year)												2671.0088	
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													
	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 m2											(98c) / (4) =	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)

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 (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	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2000	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1700	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998	(22b)

Mechanical extract ventilation - 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 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								
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, m2)			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/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)

	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	(38)
Heat transfer coeff	76.1323	76.1323	76.1323	76.1323	76.1323	76.1323	76.1323	76.1323	76.1323	76.1323	76.1323	76.1323	(39)

Average = Sum(39)m / 12 = 76.1323

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0452	1.0452	1.0452	1.0452	1.0452	1.0452	1.0452	1.0452	1.0452	1.0452	1.0452	1.0452	(40)
HLP (average)												1.0452	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3131 (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)

	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	(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	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)
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)
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)

Primary loss, Combi loss

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)
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)
-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)
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)
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)

WWHRS, PV diverter, Solar input, FGHRS

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)

Total per year (kWh/year) = Sum(64)m = 1980.9665 (64)

12Total per year (kWh/year) 1981 (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)

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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	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)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.5000	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)

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)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	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) =		0.1922	(91)
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												-0.1500	
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)

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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												76.2000	(216)
(217)m	84.2318	83.8429	83.0833	81.5864	79.0904	76.2000	76.2000	76.2000	76.2000	81.6565	83.5967	84.3770	(217)
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:
(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)
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)
	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)

	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	0.4460	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	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	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)
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	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1412	1.1379	1.1348	1.1198	1.1170	1.1040	1.1040	1.1016	1.1090	1.1170	1.1227	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)

	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	(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	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	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	-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	225.7267	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) = Sum(64)m =			2294.8958	(64)
12Total per year (kWh/year)												2295	(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	80.4266	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)

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

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.5000	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)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	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)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	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)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	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												80.3000	(216)
(217)m	85.9669	85.6943	85.1505	84.0099	82.2840	80.3000	80.3000	80.3000	80.3000	84.0554	85.4445	86.0239	(217)
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)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	-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	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	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

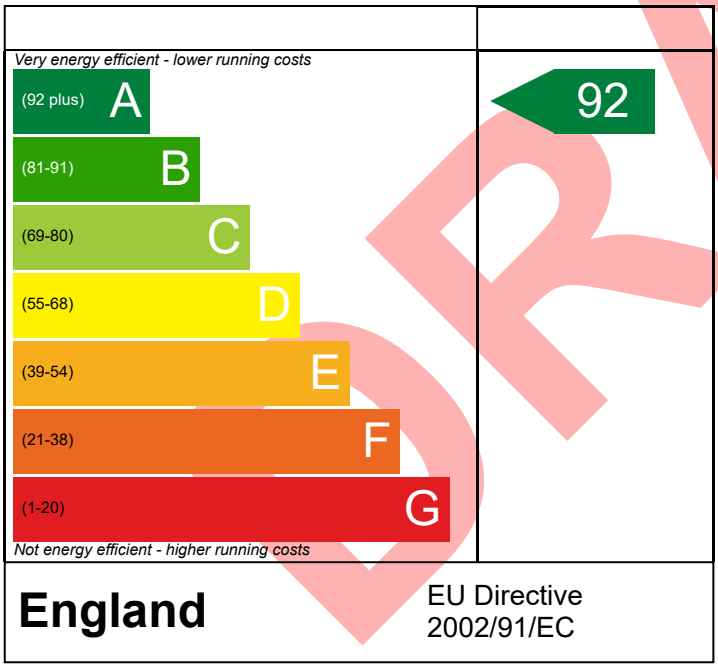
Highmoor Lane, CLECKHEATON, BD19 6LW

Dwelling type:	House, Semi-Detached
Date of assessment:	07/05/2025
Produced by:	Paul Goddard
Total floor area:	72.84 m²
DRRN:	

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.

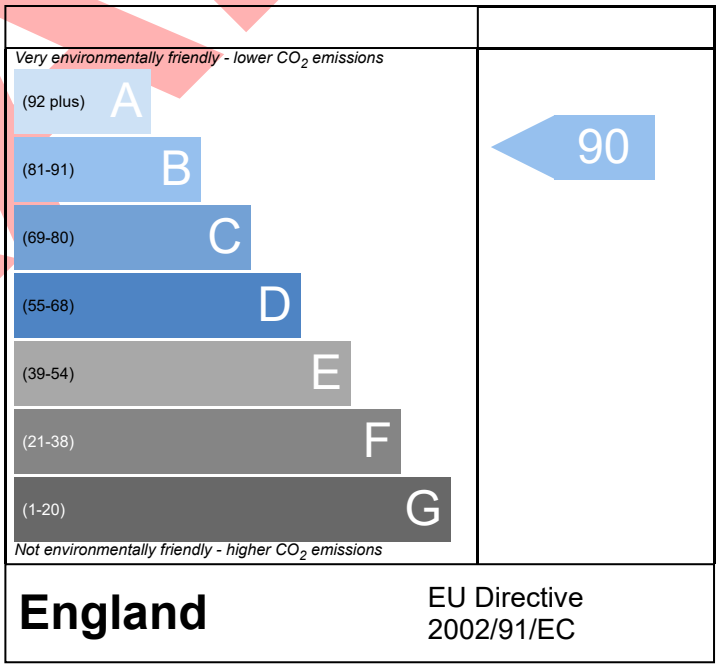
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.

Energy Efficiency 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.

Environmental Impact (CO_2) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

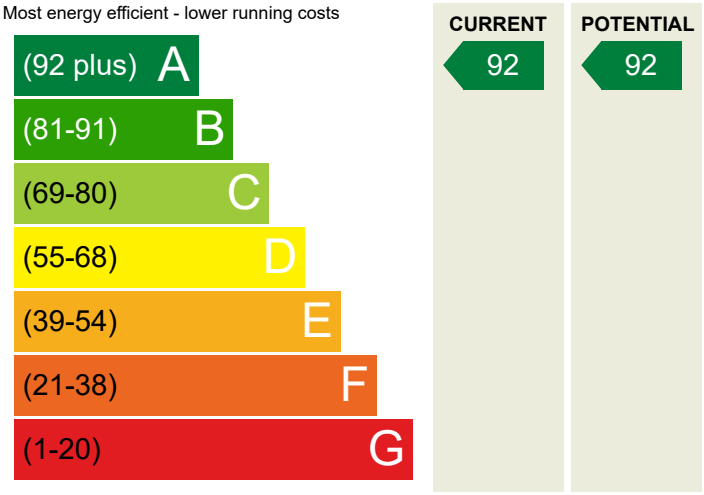
Energy Report

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

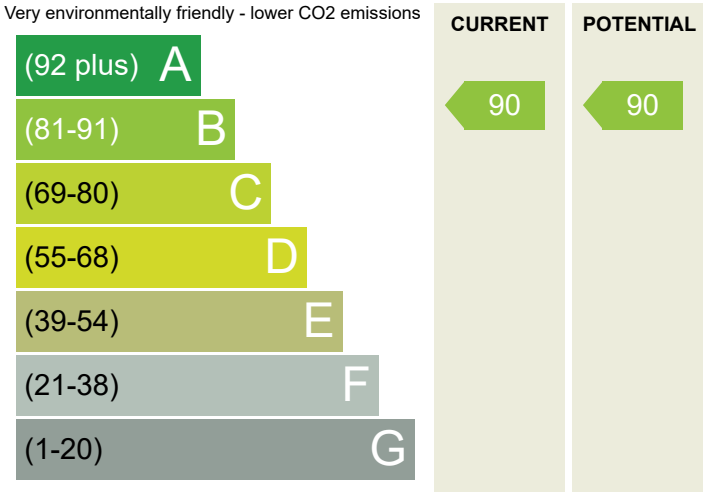
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

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

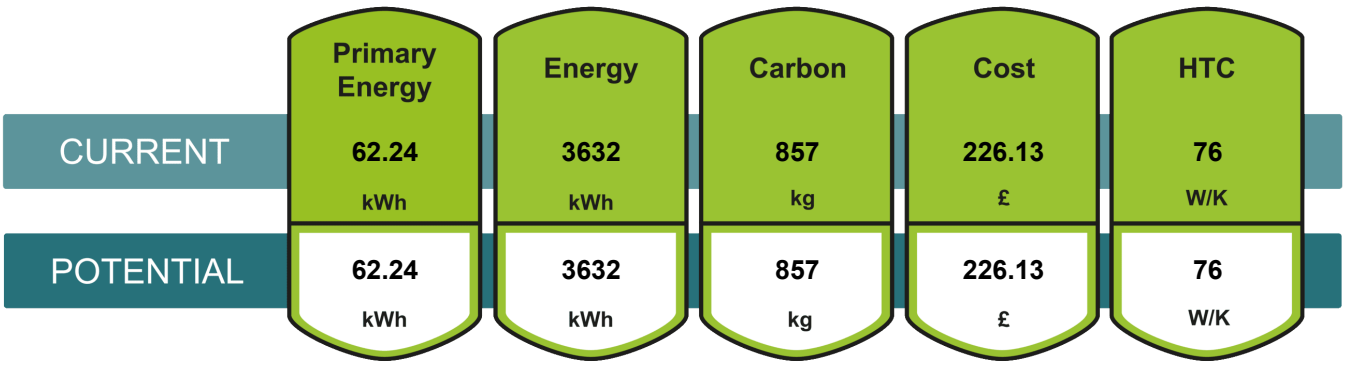
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

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/m²K	Very Good
Roof	Average thermal transmittance 0.09 W/m²K	Very Good
Floor	Average thermal transmittance 0.11 W/m²K	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 m³/h.m² (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.

Energy Report

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

Energy Report

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	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

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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	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2000	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1700	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998	(22b)

Mechanical extract ventilation - 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 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								
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, m2)			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/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	0.1000	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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.8955	39.8955	39.8955	39.8955	39.8955	39.8955	39.8955	39.8955	39.8955	39.8955	39.8955	39.8955	(38)
Heat transfer coeff	93.2641	93.2641	93.2641	93.2641	93.2641	93.2641	93.2641	93.2641	93.2641	93.2641	93.2641	93.2641	(39)

Average = Sum(39)m / 12 = 93.2641

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9836	0.9836	0.9836	0.9836	0.9836	0.9836	0.9836	0.9836	0.9836	0.9836	0.9836	0.9836	(40)
HLP (average)												0.9836	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6861 (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	1.5618	1.4396	1.5961	1.4712	1.4795	1.3773	1.3628	1.3782	1.3506	1.4474	1.4647	1.5489	(61)
Total heat required for water heating calculated for each month	225.3494	198.3550	208.4870	178.0970	169.0609	148.4487	143.7506	151.6861	155.7963	178.3596	195.2850	222.2197	(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	225.3494	198.3550	208.4870	178.0970	169.0609	148.4487	143.7506	151.6861	155.7963	178.3596	195.2850	222.2197	(64)

Total per year (kWh/year) = Sum(64)m = 2174.8952 (64)
12Total per year (kWh/year) 2175 (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	74.7998	65.8343	69.1902	59.0959	56.0907	49.2456	47.6846	50.3219	51.6908	59.1851	64.8114	73.7603	(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	134.3061	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	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)	100.5374	97.9677	92.9976	82.0776	75.3907	68.3966	64.0922	67.6370	71.7928	79.5499	90.0158	99.1401	(72)
Total internal gains	547.5672	561.8246	536.1210	515.8489	487.3221	465.4059	445.7381	446.7128	461.7806	481.8897	514.1956	535.2420	(73)

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6. Solar gains

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

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)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

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

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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												76.2000	(216)
(217)m	84.4713	84.1279	83.5067	82.3321	80.1698	76.2000	76.2000	76.2000	76.2000	82.2035	83.8895	84.6058	(217)
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	(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	11.2301	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:
(MEVDecentralised, Database: total watage = 5.7980, total flow = 37.0000, SFP = 0.1567)

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)
	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)
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)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	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	

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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)
									Total per year (kWh/year) = Sum(64)m =			2463.2317	(64)
12Total per year (kWh/year)												2463	(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	87.1491	76.9812	81.5309	71.0568	68.4605	61.2300	60.0836	62.7171	63.6820	71.5630	76.7740	86.1128	(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	134.3061	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	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, ni1,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

	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												80.3000	(216)
(217)m	86.1347	85.8918	85.4443	84.5398	83.0320	80.3000	80.3000	80.3000	80.3000	84.4430	85.6601	86.1914	(217)
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)

Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-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	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	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

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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)

		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		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	0.5524	(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								
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, m2)			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/m2K	142.9752	(35)
List of Thermal Bridges		

	Length	Psi-value	Total	
K1 Element				
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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	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)
Heat transfer coeff	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)
Average = Sum(39)m / 12 =												96.9263	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	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)
HLP (average)												1.0222	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6861 (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)

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)

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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	134.3061	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)

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6. Solar gains

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

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	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)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	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										fLA = Living area / (4) =		0.1803	(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)

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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											(98c) / (4) =	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

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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)

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2. Ventilation rate

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

Number of intermittent extract fans	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)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	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	

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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)

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, ni1,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									fLA = Living area / (4) =			0.1803	(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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9723	0.9556	0.9281	0.8613	0.7455	0.5682	0.4076	0.4569	0.6929	0.8871	0.9553	0.9759	(94)
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	(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	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 m2 (98c) / (4) = 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)

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

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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	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2000	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1700	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998	(22b)

Mechanical extract ventilation - 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 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								
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, m2)			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/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	0.1000	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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.8955	39.8955	39.8955	39.8955	39.8955	39.8955	39.8955	39.8955	39.8955	39.8955	39.8955	39.8955	(38)
Heat transfer coeff	93.2641	93.2641	93.2641	93.2641	93.2641	93.2641	93.2641	93.2641	93.2641	93.2641	93.2641	93.2641	(39)

Average = Sum(39)m / 12 = 93.2641

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9836	0.9836	0.9836	0.9836	0.9836	0.9836	0.9836	0.9836	0.9836	0.9836	0.9836	0.9836	(40)
HLP (average)												0.9836	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6861 (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	1.5618	1.4396	1.5961	1.4712	1.4795	1.3773	1.3628	1.3782	1.3506	1.4474	1.4647	1.5489	(61)
Total heat required for water heating calculated for each month	225.3494	198.3550	208.4870	178.0970	169.0609	148.4487	143.7506	151.6861	155.7963	178.3596	195.2850	222.2197	(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	225.3494	198.3550	208.4870	178.0970	169.0609	148.4487	143.7506	151.6861	155.7963	178.3596	195.2850	222.2197	(64)

Total per year (kWh/year) = Sum(64)m = 2174.8952 (64)
12Total per year (kWh/year) 2175 (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	74.7998	65.8343	69.1902	59.0959	56.0907	49.2456	47.6846	50.3219	51.6908	59.1851	64.8114	73.7603	(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	134.3061	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	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)	100.5374	97.9677	92.9976	82.0776	75.3907	68.3966	64.0922	67.6370	71.7928	79.5499	90.0158	99.1401	(72)
Total internal gains	547.5672	561.8246	536.1210	515.8489	487.3221	465.4059	445.7381	446.7128	461.7806	481.8897	514.1956	535.2420	(73)

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6. Solar gains

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

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)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

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

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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												76.2000	(216)
(217)m	84.4713	84.1279	83.5067	82.3321	80.1698	76.2000	76.2000	76.2000	76.2000	82.2035	83.8895	84.6058	(217)
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	(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	11.2301	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:
(MEVDecentralised, Database: total watage = 5.7980, total flow = 37.0000, SFP = 0.1567)

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)
	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)
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)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	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	

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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)
									Total per year (kWh/year) = Sum(64)m =			2463.2317	(64)
12Total per year (kWh/year)												2463	(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	87.1491	76.9812	81.5309	71.0568	68.4605	61.2300	60.0836	62.7171	63.6820	71.5630	76.7740	86.1128	(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	134.3061	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	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, ni1,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

	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												80.3000	(216)
(217)m	86.1347	85.8918	85.4443	84.5398	83.0320	80.3000	80.3000	80.3000	80.3000	84.4430	85.6601	86.1914	(217)
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)

Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-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	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	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

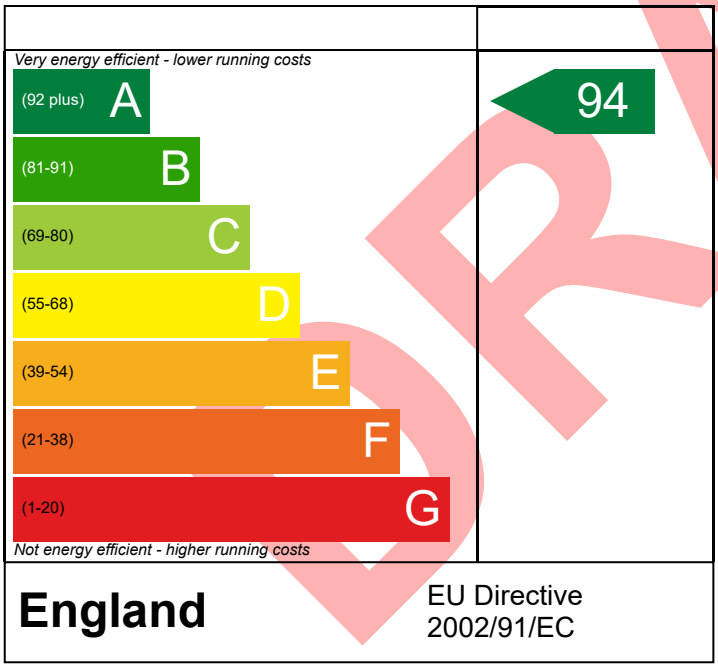
Highmoor Lane, CLECKHEATON, BD19 6LW

Dwelling type:	House, Semi-Detached
Date of assessment:	07/05/2025
Produced by:	Paul Goddard
Total floor area:	94.82 m²
DRRN:	

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.

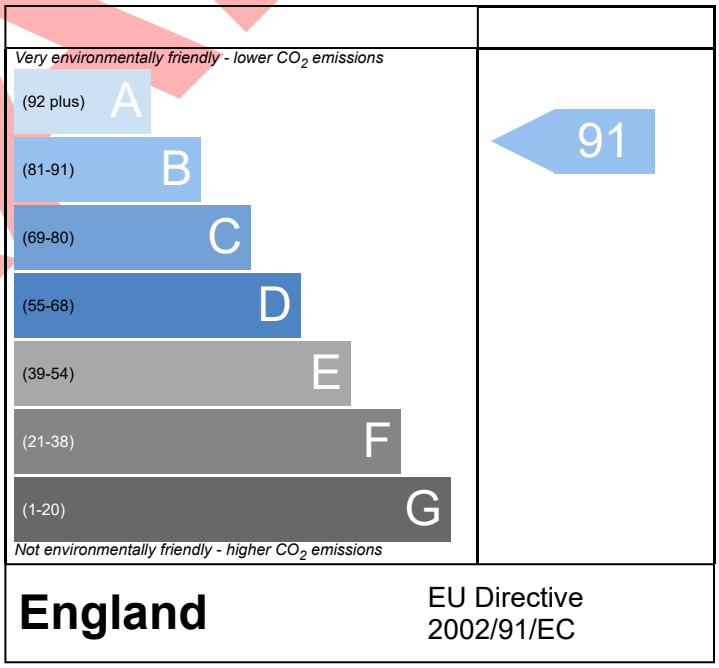
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.

Energy Efficiency 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.

Environmental Impact (CO_2) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

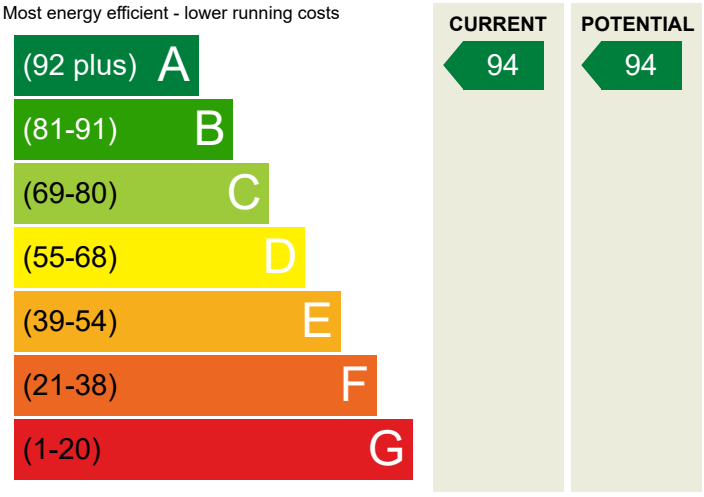
Energy Report

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

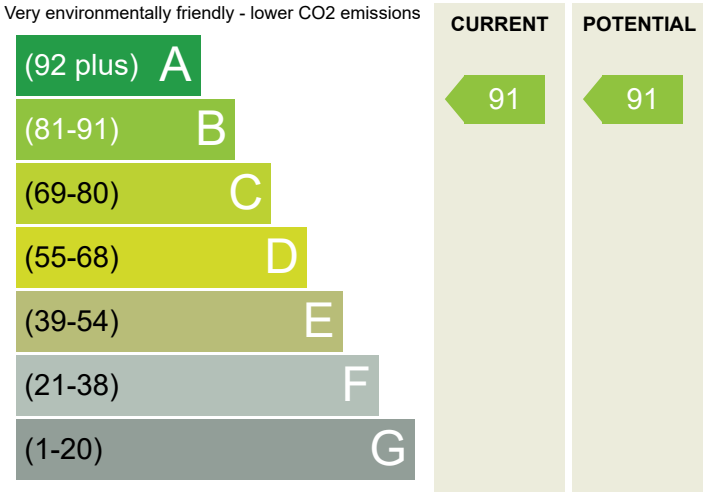
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

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

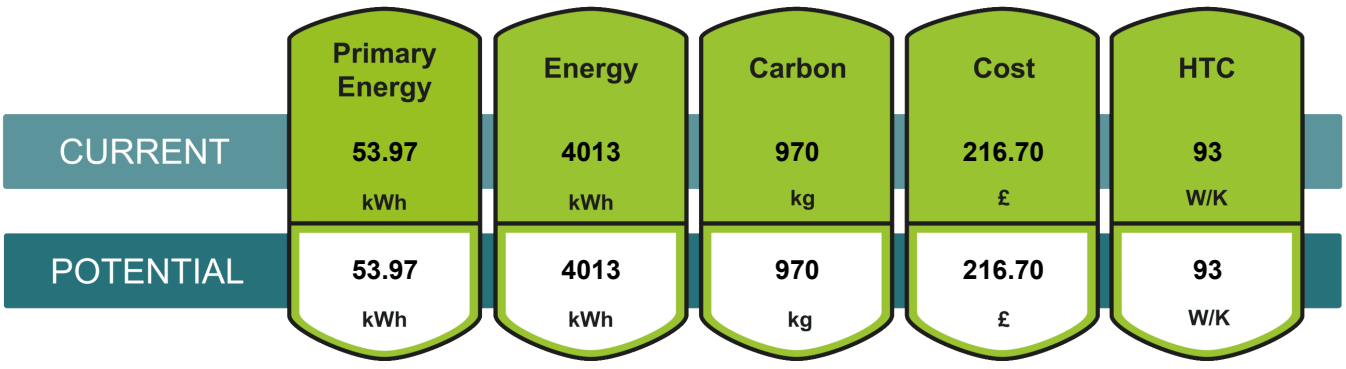
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

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/m²K	Very Good
Roof	Average thermal transmittance 0.09 W/m²K	Very Good
Floor	Average thermal transmittance 0.11 W/m²K	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 m³/h.m² (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.

Energy Report

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

Energy Report

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	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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998	(22b)

Mechanical extract ventilation - 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 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								
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, m2)			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/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	0.1000	2.2680
E6 Intermediate floor within a dwelling	22.6800	0.0700	1.5876
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) 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	(38)
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	(39)

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	(40)
HLP (average)												1.0814	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6877 (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)

	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) 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)
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)
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)

Primary loss / Combi loss

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)
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)
-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)
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)
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)

WWHRS / PV diverter / Solar input / FGHRS

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)

Total per year (kWh/year) = Sum(64)m = 2175.7225 (64)

12Total per year (kWh/year) 2176 (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)

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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	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	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-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	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)

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6. Solar gains

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

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	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 / (4) =			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)

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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												76.2000	(216)
(217)m	84.7615	84.3923	83.7214	82.4778	80.2310	76.2000	76.2000	76.2000	76.2000	82.4852	84.1979	84.8950	(217)
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:
(MEVDecentralised, 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)
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)
	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)

	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)
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	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	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)

	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	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	
HLP	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	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6877 (42)

Hot water usage for mixer showers

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

	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)										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	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)
									Total per year (kWh/year) = Sum(64)m =			2463.9507	(64)
12Total per year (kWh/year)												2464	(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

	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	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												
	557.2089	570.6791	545.7444	525.2381	496.9475	474.7895	455.3717	456.3401	471.1680	491.5182	523.5808	544.8768 (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, ni1,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) =			0.1874	(91)
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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	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												80.3000	(216)
(217)m	86.2916	86.0258	85.5380	84.5769	83.0051	80.3000	80.3000	80.3000	80.3000	84.5746	85.8286	86.3534	(217)
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)

Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-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	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	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)

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 FABRIC ENERGY EFFICIENCY

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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)

		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		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 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								
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, m2)			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/m2K					141.4578			(35)
List of Thermal Bridges								

	Length	Psi-value	Total	
K1 Element				
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	0.1000	2.2680	
E6 Intermediate floor within a dwelling	22.6800	0.0700	1.5876	
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)			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	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	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	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)
HLP (average)												1.1200	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6877 (42)

Hot water usage for mixer showers

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

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)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	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										fLA = Living area / (4) =		0.1874	(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)

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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										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	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

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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)

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2. Ventilation rate

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

Number of intermittent extract fans	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)

	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)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	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)

	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	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	
HLP	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	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6877	(42)

Hot water usage for mixer showers

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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, ni1,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										fLA = Living area / (4) =		0.1874	(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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9670	0.9443	0.9069	0.8246	0.6942	0.5174	0.3665	0.4156	0.6505	0.8638	0.9467	0.9716	(94)
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	(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													
	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 m2											(98c) / (4) =	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)

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)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998	(22b)

Mechanical extract ventilation - 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 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								
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, m2)			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/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	0.1000	2.2680
E6 Intermediate floor within a dwelling	22.6800	0.0700	1.5876
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) 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	(38)
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	(39)

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	(40)
HLP (average)												1.0814	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6877 (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)

	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) 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	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)

Total per year (kWh/year) = Sum(64)m = 2175.7225 (64)
12Total per year (kWh/year) 2176 (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)

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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	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	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-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	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)

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6. Solar gains

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

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	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 / (4) =			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)

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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												76.2000	(216)
(217)m	84.7615	84.3923	83.7214	82.4778	80.2310	76.2000	76.2000	76.2000	76.2000	82.4852	84.1979	84.8950	(217)
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:
(MEVDecentralised, 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)
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)
	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)

	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)
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	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	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)

	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	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	
HLP	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	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6877 (42)

Hot water usage for mixer showers

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

	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)										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	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)
									Total per year (kWh/year) = Sum(64)m =			2463.9507	(64)
12Total per year (kWh/year)												2464	(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

	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	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												
	557.2089	570.6791	545.7444	525.2381	496.9475	474.7895	455.3717	456.3401	471.1680	491.5182	523.5808	544.8768 (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, ni1,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) =			0.1874	(91)
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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	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												80.3000	(216)
(217)m	86.2916	86.0258	85.5380	84.5769	83.0051	80.3000	80.3000	80.3000	80.3000	84.5746	85.8286	86.3534	(217)
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)

Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-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	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	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

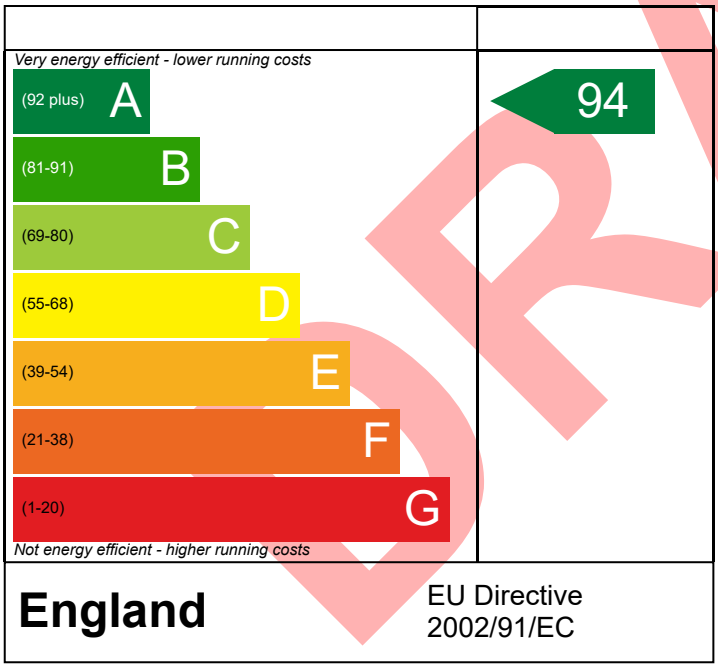
Highmoor Lane, CLECKHEATON, BD19 6LW

Dwelling type:	House, Semi-Detached
Date of assessment:	07/05/2025
Produced by:	Paul Goddard
Total floor area:	94.96 m²
DRRN:	

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.

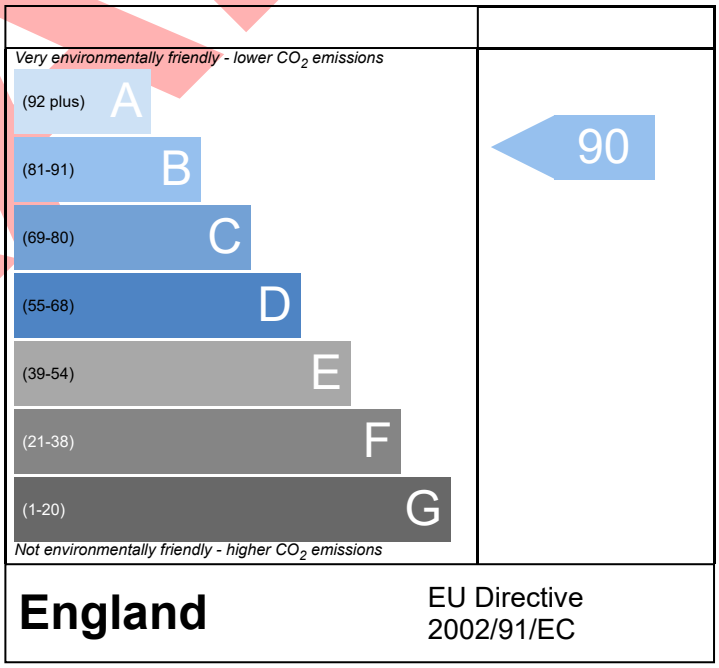
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.

Energy Efficiency 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.

Environmental Impact (CO_2) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

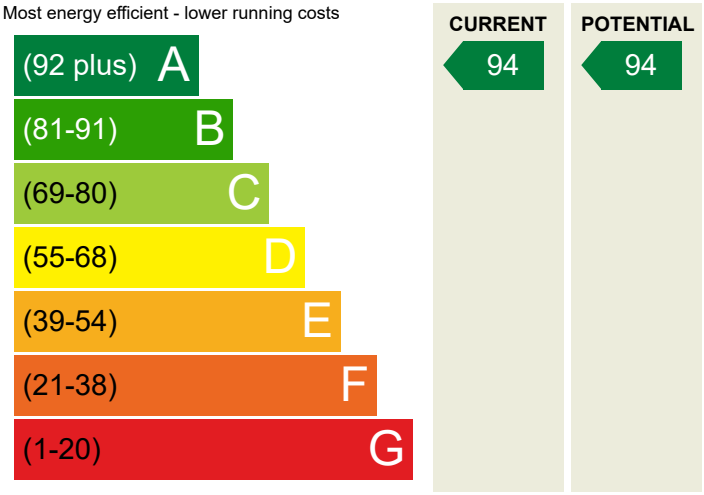
Energy Report

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

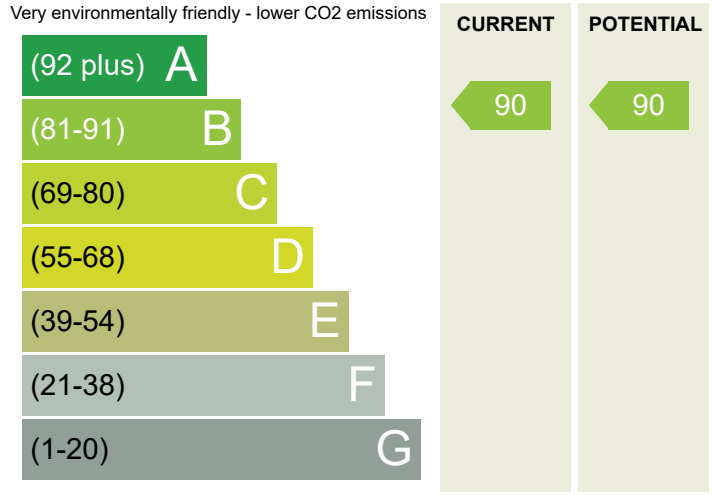
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

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

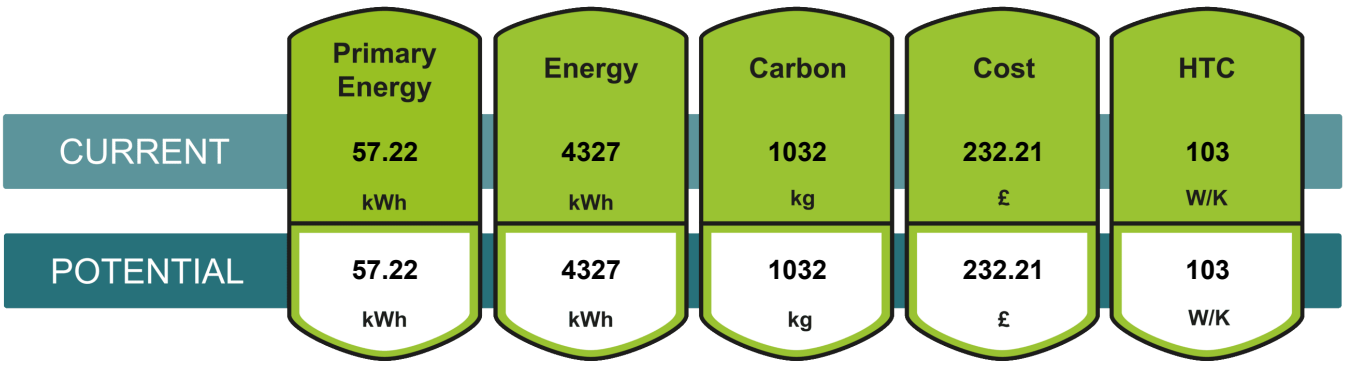
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

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/m²K	Very Good
Roof	Average thermal transmittance 0.09 W/m²K	Very Good
Floor	Average thermal transmittance 0.11 W/m²K	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 m³/h.m² (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.

Energy Report

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

Energy Report

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	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

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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)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				4.0000	(17)
Infiltration rate				0.2000	(18)
Number of sides sheltered				2	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1700	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998	(22b)

Mechanical extract ventilation - 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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
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, m2)			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/m2K							141.3495	(35)

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)

	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	(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	

	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	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6877 (42)

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

	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)										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	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)
									Total per year (kWh/year) = Sum(64)m =			2175.7225	(64)
12Total per year (kWh/year)												2176	(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)

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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	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)

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6. Solar gains

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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, ni1,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)

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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												76.2000	(216)
(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	(217)
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:

(MEVDecentralised, 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)

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)
	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)

	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)
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)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	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

	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	0.1600	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	

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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)

	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)										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	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)
										Total per year (kWh/year) = Sum(64)m =		2463.9507	(64)
12Total per year (kWh/year)												2464	(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)

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

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

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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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									fLA = Living area / (4) =			0.1874	(91)
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	(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												80.3000	(216)
(217)m	86.4092	86.2063	85.8023	84.9694	83.4888	80.3000	80.3000	80.3000	80.3000	84.9188	85.9983	86.4602	(217)
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)													

(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)

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 FABRIC ENERGY EFFICIENCY

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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)

		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		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 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								
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, m2)			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/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	0.1000	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)

	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	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)
Average = Sum(39)m / 12 =												109.3461	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	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)
HLP (average)												1.1515	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6877 (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)
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)
										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)

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6. Solar gains

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

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)

		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)

	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)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	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

	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	0.1600	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	

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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)
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)
										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, ni1,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										fLA = Living area / (4) =		0.1874	(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 m2											(98c) / (4) =	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)

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

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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)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				4.0000	(17)
Infiltration rate				0.2000	(18)
Number of sides sheltered				2	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1700	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998	(22b)

Mechanical extract ventilation - 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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
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, m2)			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/m2K							141.3495	(35)

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)

	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	(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	

	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	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6877 (42)

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

	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)										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	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)
									Total per year (kWh/year) = Sum(64)m =			2175.7225	(64)
12Total per year (kWh/year)												2176	(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)

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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	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)

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6. Solar gains

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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, ni1,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)

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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												76.2000	(216)
(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	(217)
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:

(MEVDecentralised, 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)

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)
	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)

	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)
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)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	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

	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	0.1600	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	

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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)

	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)										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	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)
										Total per year (kWh/year) = Sum(64)m =		2463.9507	(64)
12Total per year (kWh/year)												2464	(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)

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

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

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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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									fLA = Living area / (4) =			0.1874	(91)
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	(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												80.3000	(216)
(217)m	86.4092	86.2063	85.8023	84.9694	83.4888	80.3000	80.3000	80.3000	80.3000	84.9188	85.9983	86.4602	(217)
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)													

(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

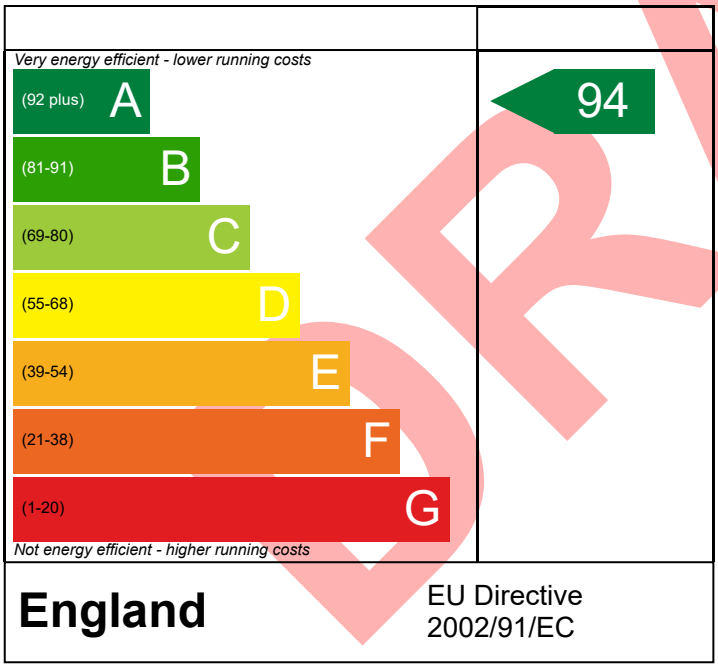
Highmoor Lane, CLECKHEATON, BD19 6LW

Dwelling type:	House, Detached
Date of assessment:	07/05/2025
Produced by:	Paul Goddard
Total floor area:	94.96 m²
DRRN:	

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.

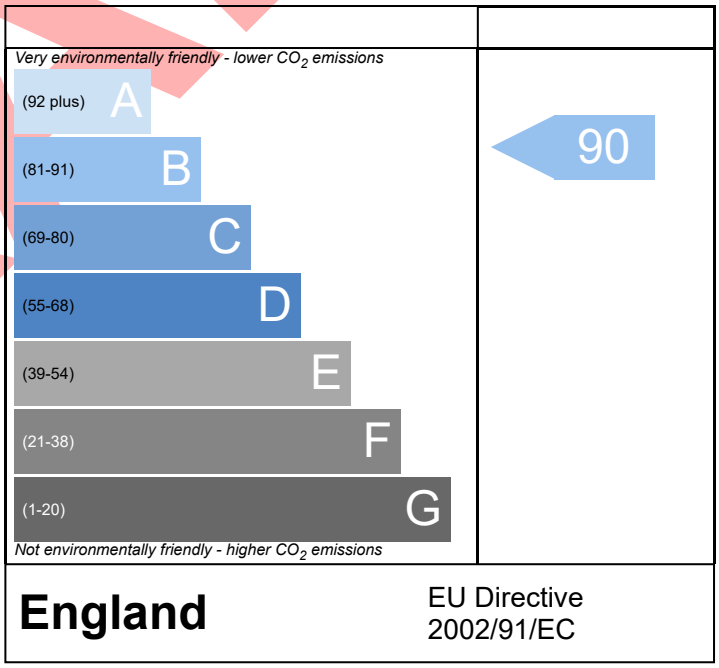
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.

Energy Efficiency 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.

Environmental Impact (CO_2) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

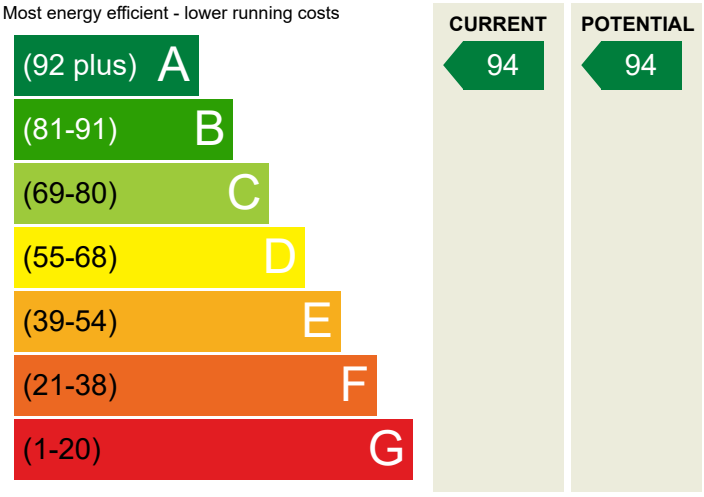
Energy Report

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

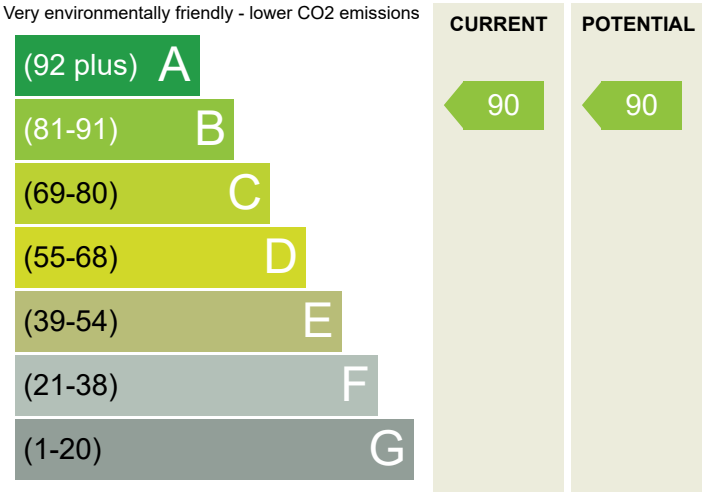
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

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

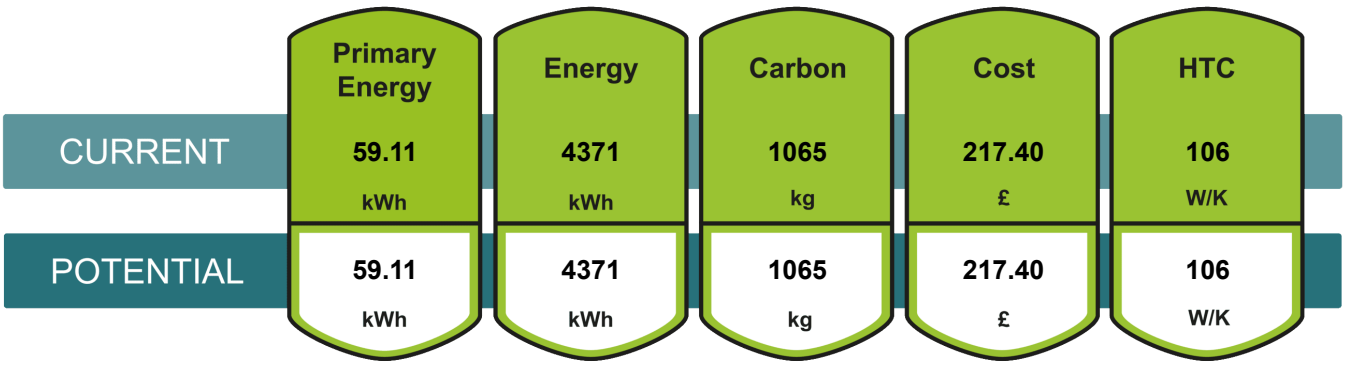
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

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/m²K	Very Good
Roof	Average thermal transmittance 0.09 W/m²K	Very Good
Floor	Average thermal transmittance 0.12 W/m²K	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 m³/h.m² (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.

Energy Report

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

Energy Report

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	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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998	(22b)
Mechanical extract ventilation - 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 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								
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, m2)			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/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	0.1000	1.9650
E6	Intermediate floor within a dwelling	19.6500	0.0700	1.3755
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) 10.9250 (36)

Point Thermal bridges (36a) = 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)

	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	(38)
Heat transfer coeff	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)

Average = Sum(39)m / 12 = 96.7778

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	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)
HLP (average)												1.0191	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6877 (42)

Hot water usage for mixer showers

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

	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)										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	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)
										Total per year (kWh/year) = Sum(64)m =		2175.7225	(64)
12Total per year (kWh/year)												2176	(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)

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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	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-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)

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6. Solar gains

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

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7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	38.7744	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 / (4) =			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)

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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:

(MEVDecentralised, 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)
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)
	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)

	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)
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)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	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)

	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	

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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)

	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)										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	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)
									Total per year (kWh/year) = Sum(64)m =			2463.9507	(64)
12Total per year (kWh/year)												2464	(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)

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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	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, ni1,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) =		0.1874	(91)
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												80.3000	(216)
(217)m	86.1581	85.8729	85.3842	84.4587	82.9697	80.3000	80.3000	80.3000	80.3000	84.3513	85.6619	86.2231	(217)
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)

Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-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	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	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)

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 FABRIC ENERGY EFFICIENCY

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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)

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2. Ventilation rate

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

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

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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								
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, m2)			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/m2K		142.2601 (35)
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)	19.6500	0.1000	1.9650	
E6 Intermediate floor within a dwelling	19.6500	0.0700	1.3755	
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)			10.9250	(36)
Point Thermal bridges		(36a) =	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)

	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	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	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0710	1.0690	1.0670	1.0577	1.0560	1.0479	1.0479	1.0464	1.0510	1.0560	1.0595	1.0632	(40)
HLP (average)												1.0577	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6877	(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)
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)
					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)

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

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6. Solar gains

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

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)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	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) =		0.1874	(91)
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)

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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) =		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	42.6828	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

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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)

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2. Ventilation rate

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

Number of intermittent extract fans	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)

	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)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	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

	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)	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	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.6877 (42)

Hot water usage for mixer showers

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

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 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	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, ni1,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										fLA = Living area / (4) =		0.1874	(91)
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	(92)
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

	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	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)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998	(22b)
Mechanical extract ventilation - 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 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								
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, m2)			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/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	0.1000	1.9650
E6	Intermediate floor within a dwelling	19.6500	0.0700	1.3755
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) 10.9250 (36)

Point Thermal bridges (36a) = 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)

	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	(38)
Heat transfer coeff	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)

Average = Sum(39)m / 12 = 96.7778

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	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)
HLP (average)												1.0191	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6877 (42)

Hot water usage for mixer showers

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

	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)										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	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)
										Total per year (kWh/year) = Sum(64)m =		2175.7225	(64)
12Total per year (kWh/year)												2176	(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)

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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	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-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)

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6. Solar gains

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

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7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	38.7744	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 / (4) =			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)

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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:

(MEVDecentralised, 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)
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)
	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)

	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)
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)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	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)

	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	

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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)

	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)										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	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)
									Total per year (kWh/year) = Sum(64)m =			2463.9507	(64)
12Total per year (kWh/year)												2464	(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)

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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	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, ni1,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) =		0.1874	(91)
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												80.3000	(216)
(217)m	86.1581	85.8729	85.3842	84.4587	82.9697	80.3000	80.3000	80.3000	80.3000	84.3513	85.6619	86.2231	(217)
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)

Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-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	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	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

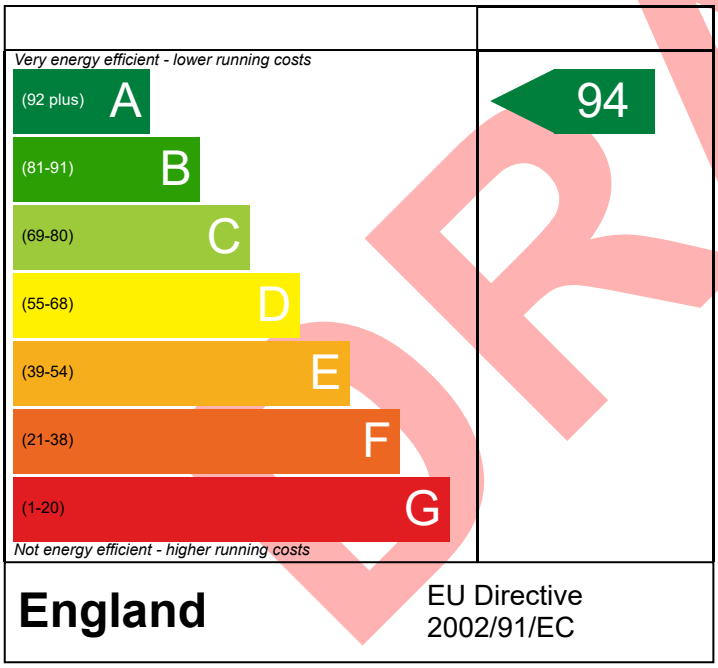
Highmoor Lane, CLECKHEATON, BD19 6LW

Dwelling type:	House, Semi-Detached
Date of assessment:	07/05/2025
Produced by:	Paul Goddard
Total floor area:	94.96 m²
DRRN:	

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.

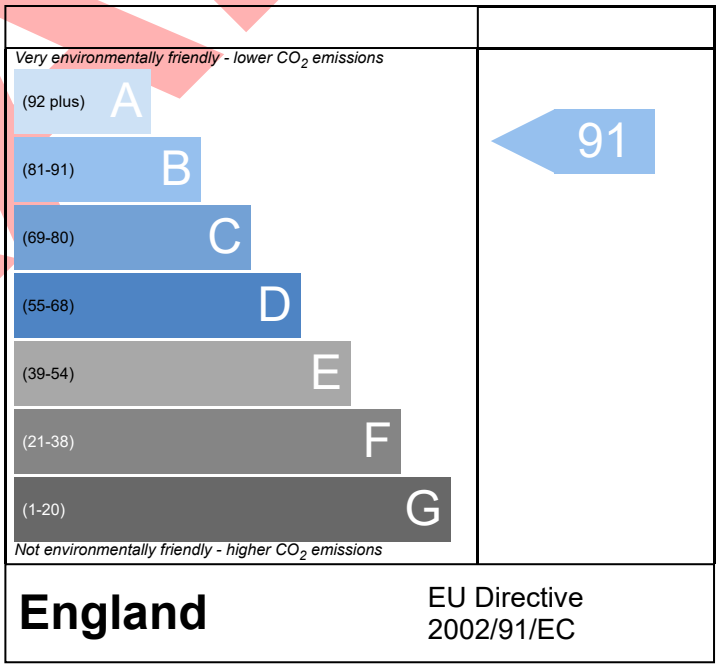
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.

Energy Efficiency 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.

Environmental Impact (CO_2) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

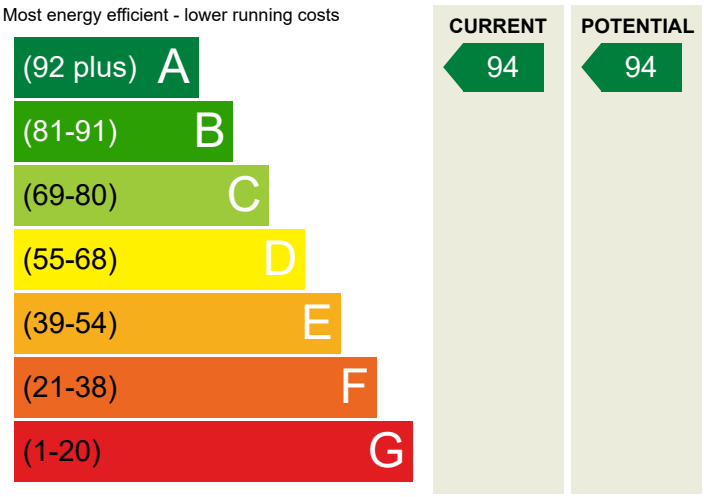
Energy Report

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

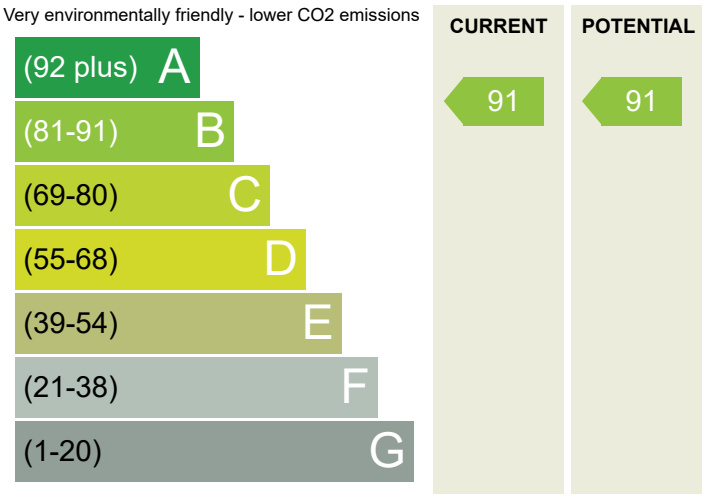
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

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

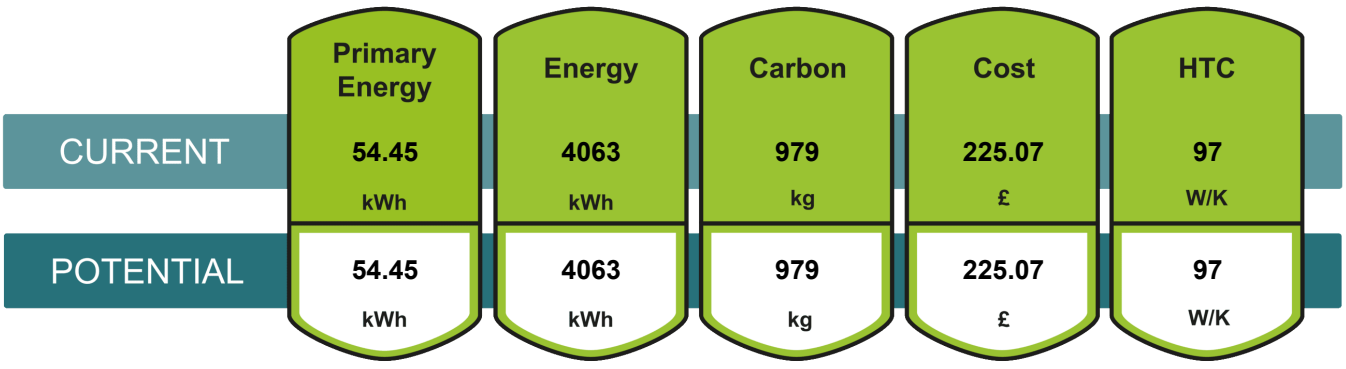
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

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/m²K	Very Good
Roof	Average thermal transmittance 0.09 W/m²K	Very Good
Floor	Average thermal transmittance 0.11 W/m²K	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 m³/h.m² (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.

Energy Report

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

Energy Report

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	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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998	(22b)

Mechanical extract ventilation - 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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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 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								
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, m2)			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/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	0.1000	1.9750
E6 Intermediate floor within a dwelling	19.7500	0.0700	1.3825
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) 10.2886 (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	(38)
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	(39)

Average = Sum(39)m / 12 = 91.4866

	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	(40)
HLP (average)												0.9708	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6794 (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)

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)
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	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) = Sum(64)m = 2171.4190 (64)
12Total per year (kWh/year) 2171 (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

	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	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-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)

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6. Solar gains

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

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)

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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	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)

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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												76.2000	(216)
(217)m	84.4576	84.1079	83.4760	82.2387	79.9387	76.2000	76.2000	76.2000	76.2000	82.0765	83.8519	84.5946	(217)
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:
(MEVDecentralised, Database: total watage = 4.6540, total flow = 29.0000, SFP = 0.1605)

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)
	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)

	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	0.4062	0.3983	0.3903	0.3505	0.3425	0.3027	0.3027	0.2947	0.3186	0.3425	0.3584	0.3744	(22b)
Effective ac	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)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.1949	45.9408	45.6917	44.5219	44.3031	43.2842	43.2842	43.0955	43.6766	44.3031	44.7458	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	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0517	1.0490	1.0464	1.0340	1.0317	1.0208	1.0208	1.0188	1.0250	1.0317	1.0364	1.0413	(40)
HLP (average)												1.0340	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6794 (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)
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)
									Total per year (kWh/year) = Sum(64)m =			2460.2104	(64)
12Total per year (kWh/year)												2460	(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	87.0284	76.8751	81.4194	70.9616	68.3702	61.1507	60.0069	62.6361	63.5987	71.4676	76.6695	85.9938	(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	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	(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, ni1,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) =		0.1443	(91)
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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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													
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												80.3000	(216)
(217)m	86.1333	85.8879	85.4355	84.4920	82.8979	80.3000	80.3000	80.3000	80.3000	84.3700	85.6424	86.1900	(217)
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)

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)

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 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)

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2. Ventilation rate

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

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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								
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, m2)			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/m2K		170.6160 (35)
List of Thermal Bridges		

	Length	Psi-value	Total	
K1 Element				
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	0.1000	1.9750	
E6 Intermediate floor within a dwelling	19.7500	0.0700	1.3825	
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)			10.2886	(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	44.5657	44.3748	44.1878	43.3092	43.1449	42.3797	42.3797	42.2380	42.6744	43.1449	43.4774	43.8250	(38)
Heat transfer coeff	96.4008	96.2100	96.0229	95.1444	94.9800	94.2148	94.2148	94.0731	94.5096	94.9800	95.3125	95.6602	(39)
Average = Sum(39)m / 12 =												95.1436	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0229	1.0209	1.0189	1.0096	1.0079	0.9997	0.9997	0.9982	1.0029	1.0079	1.0114	1.0151	(40)
HLP (average)												1.0096	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6794 (42)

Hot water usage for mixer showers

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

29.8578	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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	71.9278	69.9546	67.8003	65.1191	62.7272	60.2414	59.7250	61.8749	64.0799	66.6326	69.3375	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)										Total = Sum(45)m =		1094.9290	
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													
	96.8287	84.6722	88.5756	75.7731	71.7764	62.9628	61.3974	65.1220	67.1644	76.8569	83.9664	95.5940	(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													
	96.8287	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)
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)

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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	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)

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6. Solar gains

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

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	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)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	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) =		0.1443	(91)
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)

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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

	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	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)

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2. Ventilation rate

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

Number of intermittent extract fans	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)

	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	0.4062	0.3983	0.3903	0.3505	0.3425	0.3027	0.3027	0.2947	0.3186	0.3425	0.3584	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	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	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.1949	45.9408	45.6917	44.5219	44.3031	43.2842	43.2842	43.0955	43.6766	44.3031	44.7458	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	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0517	1.0490	1.0464	1.0340	1.0317	1.0208	1.0208	1.0188	1.0250	1.0317	1.0364	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

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

29.8578	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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	71.9278	69.9546	67.8003	65.1191	62.7272	60.2414	59.7250	61.8749	64.0799	66.6326	69.3375	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)										Total = Sum(45)m =		1094.9290	
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	96.8287	84.6722	88.5756	75.7731	71.7764	62.9628	61.3974	65.1220	67.1644	76.8569	83.9664	95.5940	(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	96.8287	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)

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, ni1,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											fLA = Living area / (4) =	0.1443	(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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	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)
Useful gains	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)
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													
	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 kWh													
	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)
Space heating requirement - total per year (kWh/year)												3209.9358	
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													
	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 m2											(98c) / (4) =	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) =	1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	32.5210	45.9526	36.1330	0.0000	0.0000	0.0000	0.0000	(107)

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)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998	(22b)

Mechanical extract ventilation - 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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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 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								
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, m2)			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/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	0.1000	1.9750
E6 Intermediate floor within a dwelling	19.7500	0.0700	1.3825
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) 10.2886 (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	(38)
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	(39)

Average = Sum(39)m / 12 = 91.4866

	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	(40)
HLP (average)												0.9708	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6794 (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)

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)
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	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) = Sum(64)m = 2171.4190 (64)
12Total per year (kWh/year) 2171 (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

	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	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-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)

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6. Solar gains

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

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)

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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	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)

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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												76.2000	(216)
(217)m	84.4576	84.1079	83.4760	82.2387	79.9387	76.2000	76.2000	76.2000	76.2000	82.0765	83.8519	84.5946	(217)
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:
(MEVDecentralised, Database: total watage = 4.6540, total flow = 29.0000, SFP = 0.1605)

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)
	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)

	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	0.4062	0.3983	0.3903	0.3505	0.3425	0.3027	0.3027	0.2947	0.3186	0.3425	0.3584	0.3744	(22b)
Effective ac	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)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.1949	45.9408	45.6917	44.5219	44.3031	43.2842	43.2842	43.0955	43.6766	44.3031	44.7458	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	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0517	1.0490	1.0464	1.0340	1.0317	1.0208	1.0208	1.0188	1.0250	1.0317	1.0364	1.0413	(40)
HLP (average)												1.0340	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6794 (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)
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)
									Total per year (kWh/year) = Sum(64)m =			2460.2104	(64)
12Total per year (kWh/year)												2460	(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	87.0284	76.8751	81.4194	70.9616	68.3702	61.1507	60.0069	62.6361	63.5987	71.4676	76.6695	85.9938	(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	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	(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, ni1,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) =		0.1443	(91)
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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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													
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												80.3000	(216)
(217)m	86.1333	85.8879	85.4355	84.4920	82.8979	80.3000	80.3000	80.3000	80.3000	84.3700	85.6424	86.1900	(217)
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)

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

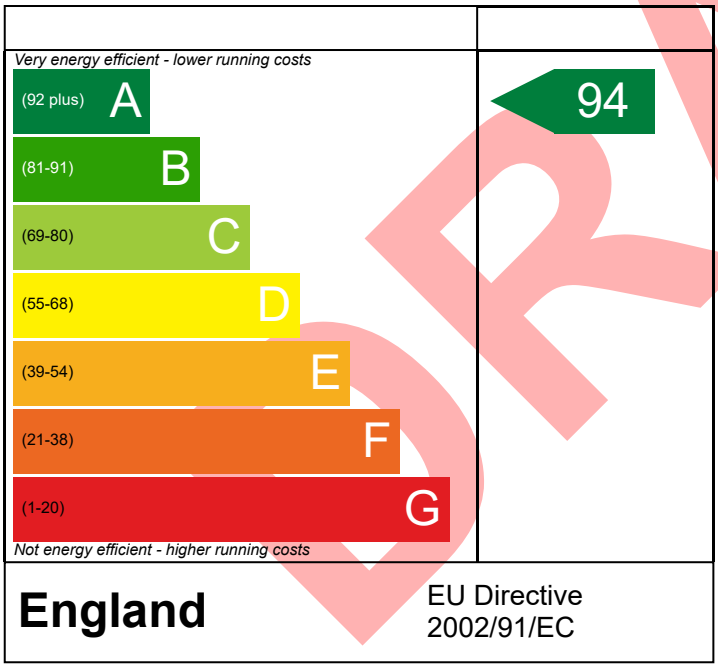
Highmoor Lane, CLECKHEATON, BD19 6LW

Dwelling type:	House, Semi-Detached
Date of assessment:	07/05/2025
Produced by:	Paul Goddard
Total floor area:	94.24 m²
DRRN:	

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.

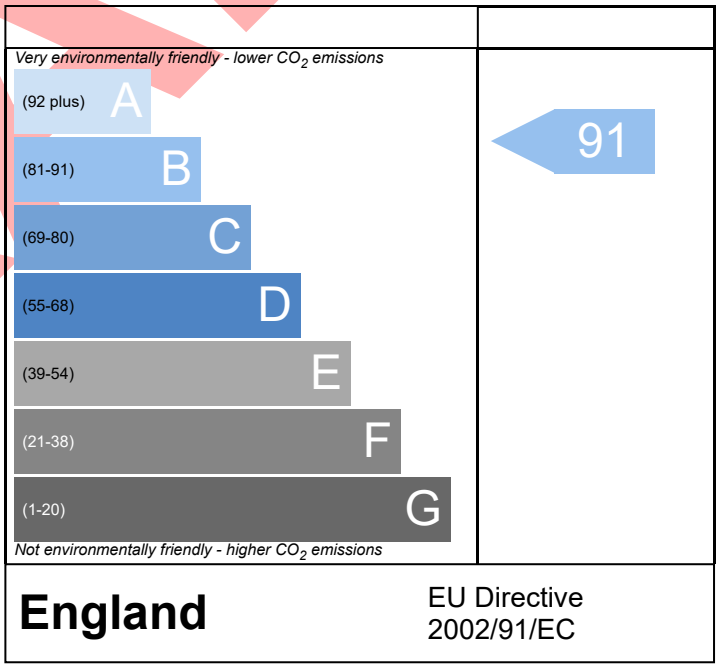
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.

Energy Efficiency 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.

Environmental Impact (CO_2) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

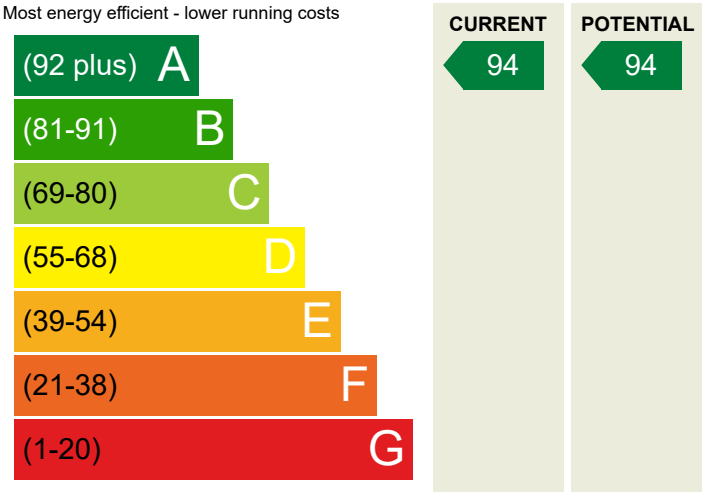
Energy Report

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

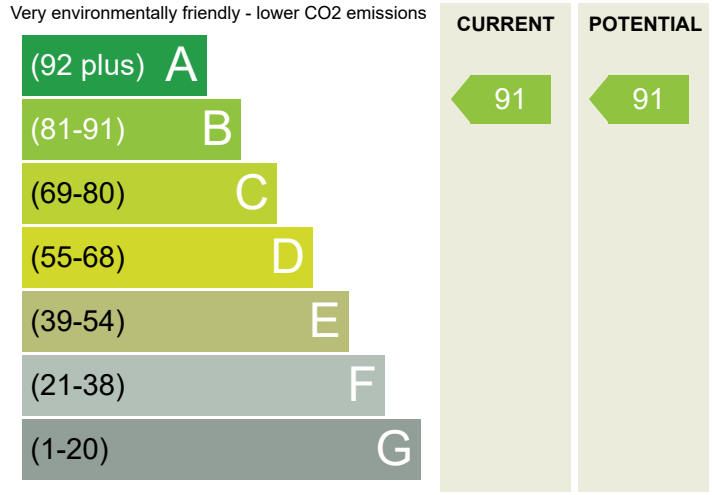
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

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

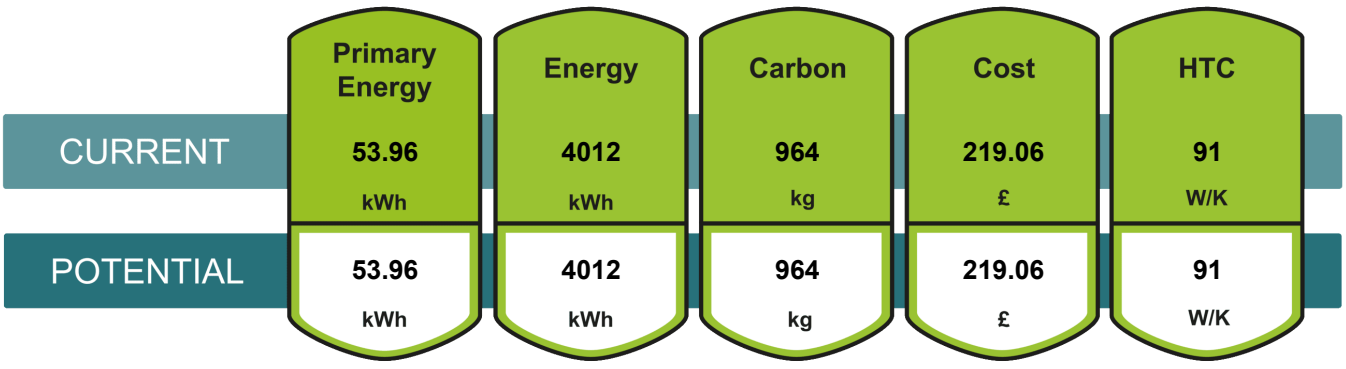
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

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/m²K	Very Good
Roof	Average thermal transmittance 0.09 W/m²K	Very Good
Floor	Average thermal transmittance 0.11 W/m²K	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 m³/h.m² (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.

Energy Report

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

Energy Report

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	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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998	(22b)

Mechanical extract ventilation - 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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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 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								
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, m2)			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)
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 Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 21570.3904 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 175.6403 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
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	51.3836	51.3836	51.3836	51.3836	51.3836	51.3836	51.3836	51.3836	51.3836	51.3836	51.3836	51.3836	(38)
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	(39)
Average = Sum(39)m / 12 =												111.8024	
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	(40)
HLP (average)												0.9104	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8735 (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 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	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)
									Total per year (kWh/year) = Sum(64)m =			2272.1315	(64)
12Total per year (kWh/year)												2272	(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)

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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	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)	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	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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	726.9497	824.3874	881.5831	955.9655	994.9306	979.6049	936.0827	881.8068	831.5154	757.3921	711.1841	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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	53.5925	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	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	0.9846	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	19.5647	(87)
Th 2	20.1587	20.1587	20.1587	20.1587	20.1587	20.1587	20.1587	20.1587	20.1587	20.1587	20.1587	20.1587	(88)
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	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	18.4613	(90)
Living area fraction										fLA = Living area / (4) =		0.1759	(91)
MIT	18.7145	18.9480	19.2771	19.7138	20.0701	20.2554	20.2981	20.2929	20.1896	19.7447	19.1488	18.6554	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.5645	18.7980	19.1271	19.5638	19.9201	20.1054	20.1481	20.1429	20.0396	19.5947	18.9988	18.5054	(93)

8. Space heating requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	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												76.2000	(216)
(217)m	85.0085	84.6592	84.0313	82.7743	80.3323	76.2000	76.2000	76.2000	76.2000	82.6684	84.4428	85.1375	(217)
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	272.6689	(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	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)

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

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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)

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2. Ventilation rate

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

	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	0.4101	0.4021	0.3941	0.3538	0.3458	0.3056	0.3056	0.2976	0.3217	0.3458	0.3619	0.3780	(22b)
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	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	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)
Heat transfer coeff	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)
Average = Sum(39)m / 12 =												118.6216	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	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)
HLP (average)												0.9659	
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)

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

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)
12Total per year (kWh/year)												2548 (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

	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									fLA = Living area / (4) =			0.1759	(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

	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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	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)

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 80.3000 (216)
(217)m 86.5078 86.2596 85.7974 84.7971 83.0511 80.3000 80.3000 80.3000 80.3000 84.7596 86.0479 86.5608 (217)
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 (219)
Space cooling fuel requirement
(221)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (221)
Pumps and Fa 7.3041 6.5973 7.3041 7.0685 7.3041 7.0685 7.3041 7.3041 7.0685 7.3041 7.0685 7.3041 (231)
Lighting 33.7321 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)

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 FABRIC ENERGY EFFICIENCY

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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)
	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		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 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								
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, m2)			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)

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 Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 21570.3904 (34)
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	0.1000	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	

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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	(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) 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)

Total per year (kWh/year) = Sum(64)m = 974.5222 (64)
12Total per year (kWh/year) 975 (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)

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

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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	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)

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6. Solar gains

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

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

	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)
		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)

	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	0.4101	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	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)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	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)
Heat transfer coeff	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)
Average = Sum(39)m / 12 =												118.6216	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	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)
HLP (average)												0.9659	
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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	(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) 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)
										Total per year (kWh/year) = Sum(64)m =		974.5222	(64)
12Total per year (kWh/year)												975	(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)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	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	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	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

[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, ni1,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													
	0.9935	0.9868	0.9732	0.9295	0.8328	0.6609	0.5013	0.5551	0.7904	0.9508	0.9873	0.9947	(86)
MIT	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)
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													
	0.9920	0.9837	0.9667	0.9119	0.7920	0.5880	0.4075	0.4591	0.7281	0.9350	0.9838	0.9934	(89)
MIT 2	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)
Living area fraction										fLA = Living area / (4) =		0.1759	(91)
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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	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)
Useful gains	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)
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	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 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	(98a)
Space heating requirement - total per year (kWh/year)												3972.2917	
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	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	

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)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998	(22b)

Mechanical extract ventilation - 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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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 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								
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, m2)			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)
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 Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 21570.3904 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 175.6403 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
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	51.3836	51.3836	51.3836	51.3836	51.3836	51.3836	51.3836	51.3836	51.3836	51.3836	51.3836	51.3836	(38)
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	(39)
Average = Sum(39)m / 12 =												111.8024	
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	(40)
HLP (average)												0.9104	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8735 (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 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	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)
									Total per year (kWh/year) = Sum(64)m =			2272.1315	(64)
12Total per year (kWh/year)												2272	(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)

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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	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)	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	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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	726.9497	824.3874	881.5831	955.9655	994.9306	979.6049	936.0827	881.8068	831.5154	757.3921	711.1841	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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	53.5925	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	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	0.9846	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	19.5647	(87)
Th 2	20.1587	20.1587	20.1587	20.1587	20.1587	20.1587	20.1587	20.1587	20.1587	20.1587	20.1587	20.1587	(88)
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	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	18.4613	(90)
Living area fraction										fLA = Living area / (4) =		0.1759	(91)
MIT	18.7145	18.9480	19.2771	19.7138	20.0701	20.2554	20.2981	20.2929	20.1896	19.7447	19.1488	18.6554	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.5645	18.7980	19.1271	19.5638	19.9201	20.1054	20.1481	20.1429	20.0396	19.5947	18.9988	18.5054	(93)

8. Space heating requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	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												76.2000	(216)
(217)m	85.0085	84.6592	84.0313	82.7743	80.3323	76.2000	76.2000	76.2000	76.2000	82.6684	84.4428	85.1375	(217)
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	272.6689	(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	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)

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

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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)

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2. Ventilation rate

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

	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	0.4101	0.4021	0.3941	0.3538	0.3458	0.3056	0.3056	0.2976	0.3217	0.3458	0.3619	0.3780	(22b)
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	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	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)
Heat transfer coeff	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)
Average = Sum(39)m / 12 =												118.6216	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	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)
HLP (average)												0.9659	
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)

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

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)
12Total per year (kWh/year)												2548 (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

	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									fLA = Living area / (4) =			0.1759	(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

	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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	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)

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 80.3000 (216)
(217)m 86.5078 86.2596 85.7974 84.7971 83.0511 80.3000 80.3000 80.3000 80.3000 84.7596 86.0479 86.5608 (217)
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 (219)
Space cooling fuel requirement
(221)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (221)
Pumps and Fa 7.3041 6.5973 7.3041 7.0685 7.3041 7.0685 7.3041 7.3041 7.0685 7.3041 7.0685 7.3041 (231)
Lighting 33.7321 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

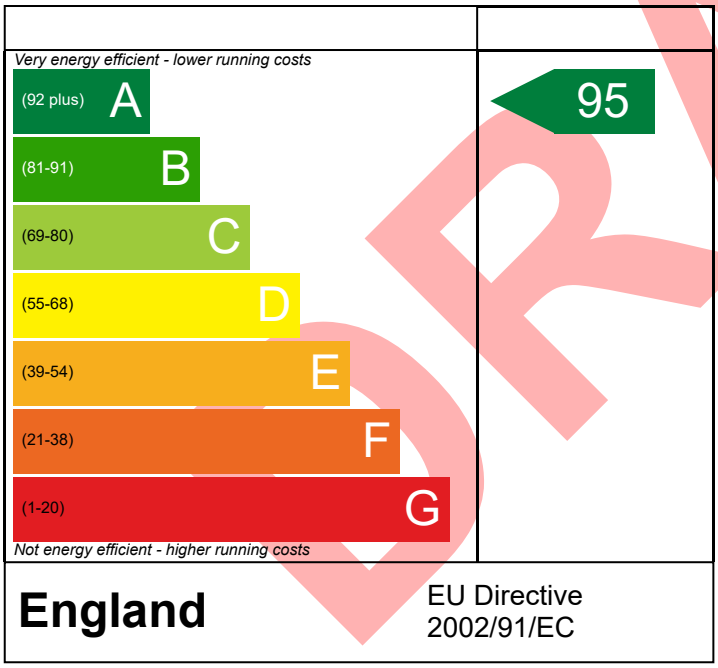
Highmoor Lane, CLECKHEATON, BD19 6LW

Dwelling type:	House, Semi-Detached
Date of assessment:	07/05/2025
Produced by:	Paul Goddard
Total floor area:	122.81 m²
DRRN:	

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.

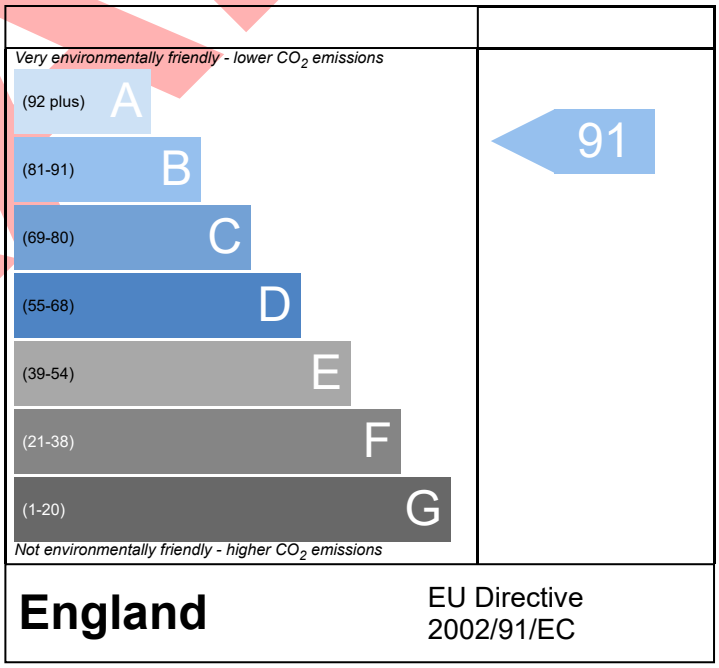
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.

Energy Efficiency 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.

Environmental Impact (CO_2) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

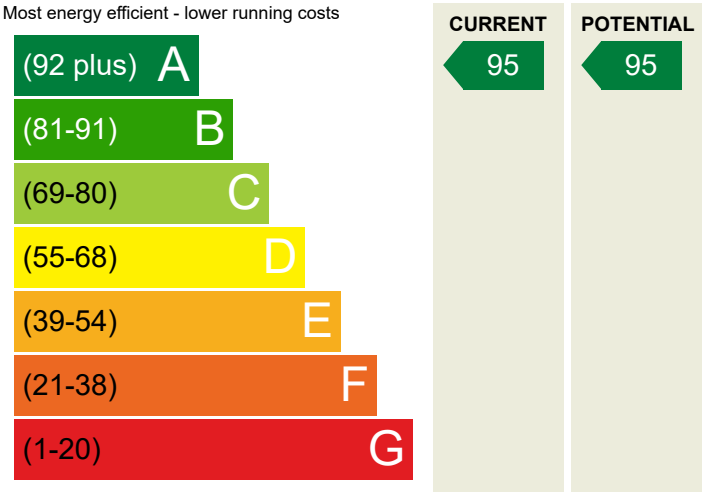
Energy Report

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

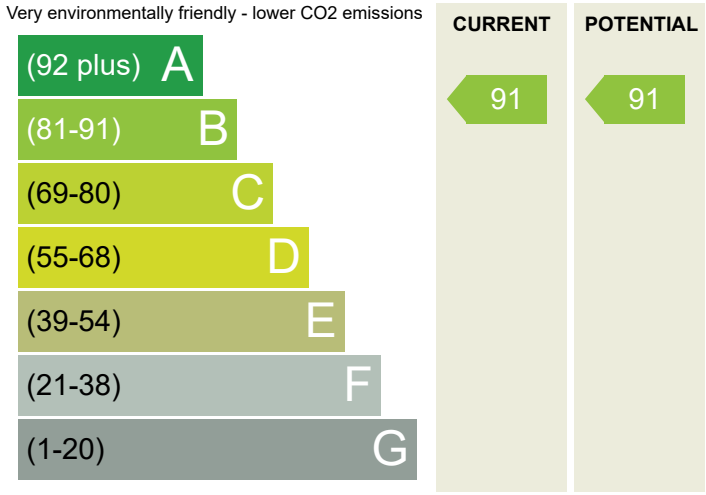
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

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

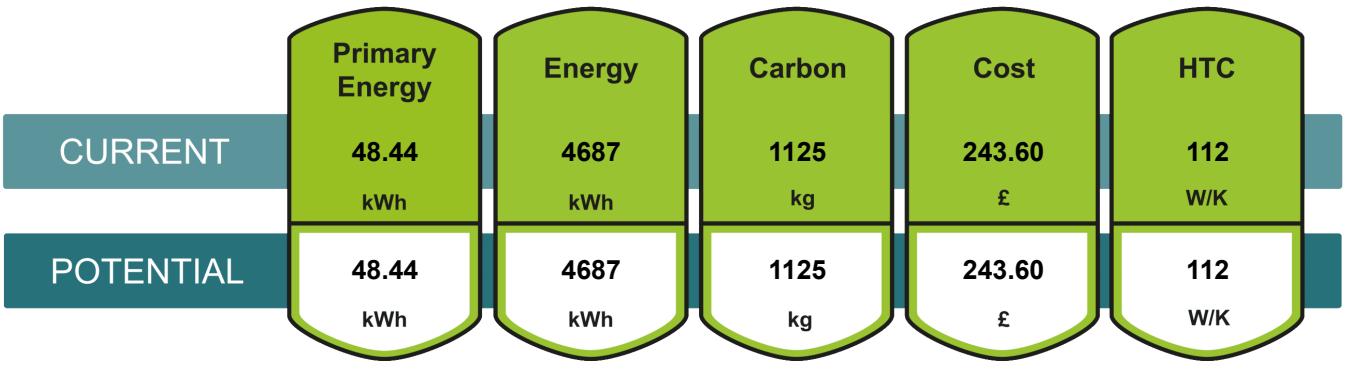
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

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 0.17 W/m²K	Very Good
Roof	Average thermal transmittance 0.11 W/m²K	Very Good
Floor	Average thermal transmittance 0.11 W/m²K	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 m³/h.m² (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.

Energy Report

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

Energy Report

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.