



Avondale Drive
Hayes

Energy and Sustainability
Statement

Planning Issue 3



Applicant Name:	London Borough of Hillingdon
Applicant Address:	Civic Centre High Street Uxbridge UB8 1UW
Site Address:	Avondale Drive Estate Hayes Town Centre
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EXECUTIVE SUMMARY

This Energy and Sustainability Statement has been prepared by Watkins Payne on behalf of the London Borough of Hillingdon ('LBH') in support of a reserved matters application for Land at Avondale Drive, pursuant to Condition 1 of the hybrid permission for the site. A Section 73 application (application ref: 76551/APP/2025/2861) is currently pending and will be determined prior to the approval of this Reserved Matters Application. Therefore, this RMA responds to the revised wording of the planning conditions proposed within the Section 73 application which is set out in Condition 34:-

Condition 34 Prior to the commencement (except for demolition, ground and enabling works) for each relevant development phase of the outline area of the development hereby approved, a detailed energy assessment shall be submitted to and approved by the London Borough of Hillingdon. The assessment shall set out the plans and specifications for the 'be clean' and 'be green' technology solutions set out in the outline energy strategy. The details shall include type, size and location of the air source heat pumps including an appraisal of the associated noise and vibration. The scheme shall details the type and size of PV panels including their pitch and orientation. The assessment shall then ensure there is clear presentation of the reduction in carbon associated with the 'be lean', 'be clean' and 'be green' including making a clear allowance for the electricity demand of the air source heat pumps. Any carbon emissions identified shall be subject to an offsite contribution. The development must proceed in accordance with the approved plans and specification and evidence of this shall be submitted for approval in writing to the Local Planning Authority.

REASON
To ensure the development achieves zero carbon in accordance with Policy SI2 of the London Plan.”

This report details the energy strategy for achieving a low carbon design for the proposed development and provides the supporting evidence via dynamic simulation modelling. The assessment is carried out in accordance with the London Plan and Hillingdon’s Local Plan.

The energy strategy follows the energy hierarchy, characterised by the Lean, Clean, Green approach, and demonstrates how the proposed development maximises on-site reductions in annual regulated CO₂ emissions through passive design measures, energy-efficient building services and the integration of on-site renewable technologies.

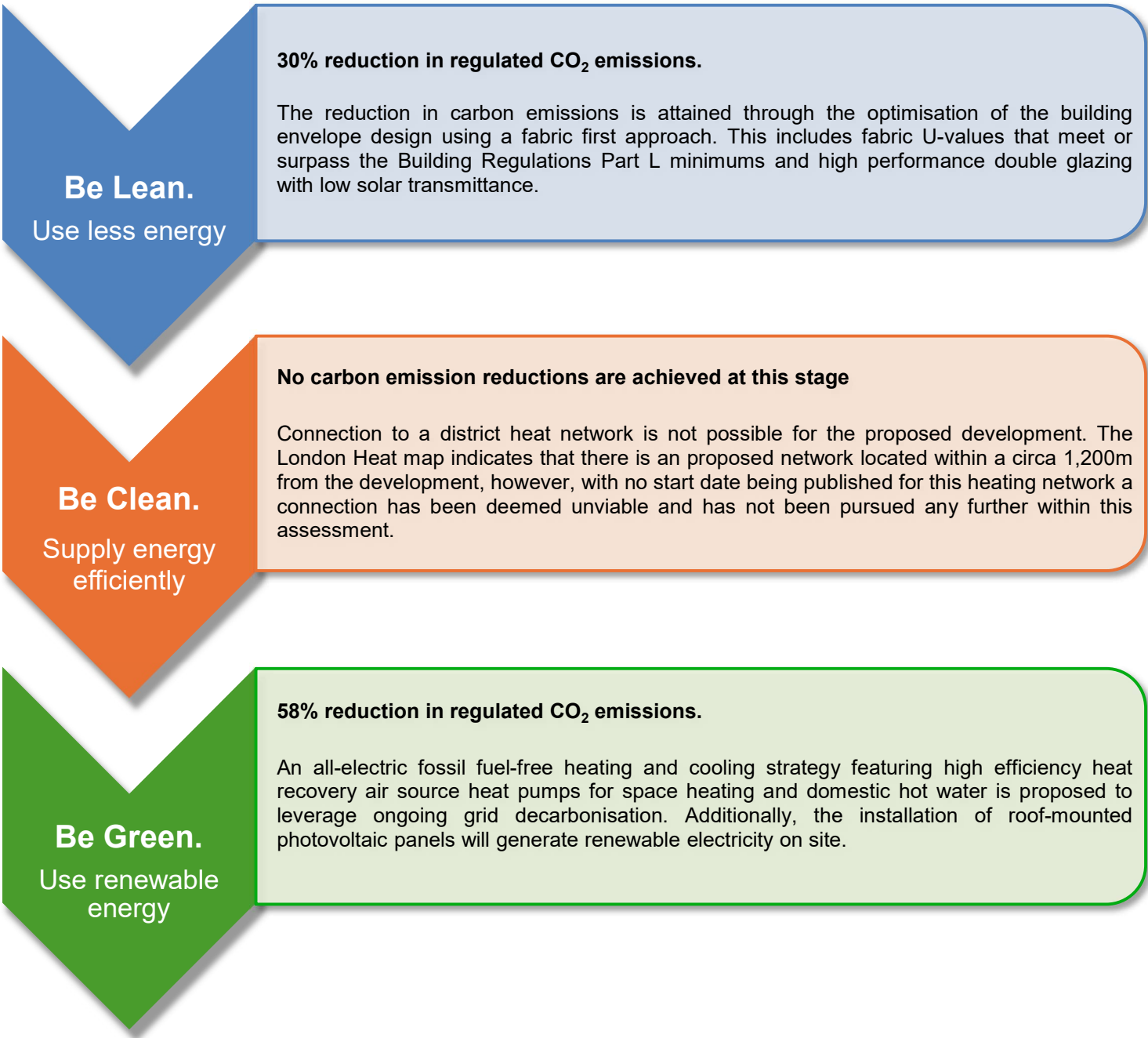
The projected annual CO₂ emissions and overall regulated carbon emission savings for the overall development are summarised in the tables below.

	Annual CO ₂ Emissions (TonnesCO ₂ /year)	
	Regulated	Unregulated
Baseline: Building Regulations Part L 2021 Compliant	251.40	5.45
After energy demand reduction (be lean)	175.00	5.45
After heat network connection (be clean)	175.00	5.45
After renewable energy (be green)	29.20	5.45

Table 1 | CO₂ emissions results

	Annual Regulated CO ₂ Savings	
	TonnesCO ₂ /year	% Improvement
Be lean: savings from energy demand reduction	76.4	30
Be clean: savings from heat network	0.0	0
Be green: savings from renewable energy (over lean)	145.8	58
Total cumulative on-site savings (over baseline)	222.2	88

Table 2 | CO₂ savings results





In addition, this report describes how the proposed development will provide appropriate levels of sustainability within the design and construction of the development. This covers the key themes of Transport, Sustainable Urban Drainage Systems (SuDS), Water, Waste, Air Quality, Ecology, and Noise

Transport

- Markides Associates have prepared a Transport Assessment Addendum which outlines the existing transport network surrounding the site and the proposed changes to it, whilst offering strategies to improve the sustainability of the development from a transport perspective. The report concluded that the proposals would not have a material impact on the operation of the local highway network and complied with relevant transport related planning policies.
- The site is in a highly sustainable location, with excellent public transport connections and active travel routes serving the site.
- Active travel is supported through end of journey facilities and cycle parking provision which exceeds Hillingdon Local Plan standards.
- Dedicated parking provision for disabled users and motorcyclists are provided, alongside Electric Vehicle charging points. All provision meets relevant standards.
- For the full details please refer to the Transport Assessment Addendum prepared by Markides Associates which should be read in conjunction with this report.

Sustainable Urban Drainage Systems (SuDS)

- The Flood Risk Assessment (FRA), prepared by Whitby Wood, confirms that the site is entirely located within Flood Zone 1, corresponding to less than a 1 in 1000 annual probability of flooding from rivers or the sea.
- The site is considered to be at very low risk from all other sources of flooding: tidal, surface water, sewers, groundwater, reservoirs and other artificial sources.
- The Drainage Strategy Addendum, prepared by Iesis Structures, confirms that the surface water drainage strategy for the proposed new development comprises the 4 attenuation tanks, and two private networks of surface water sewers which run adjacent to the proposed buildings to provide collection points for rainwater pipes and surface runoff from the properties
- The FRA confirms that the residual flood risk from the development is concluded to be very low. The development is not considered to increase the risk of flooding to the site or to neighbouring properties.
- For the full details please refer to the Flood Risk Assessment and Drainage Strategy Addendum prepared by Whitby Wood and Iesis Structures respectively, which should be read in conjunction with this report.

Water

- The Energy and Sustainability Strategy report prepared by Watkins Payne confirms that all water fixture and fittings will be specified to minimise water consumption. This will include the specification of low flow taps and dual flush toilets. The development will target a water consumption rate of 105l per person per day, in line with the local council's regulations.

Waste

- Materials used in the construction stage will be ordered to minimise waste and ensure that the construction stage is as efficient as possible.
- The waste strategy proposed ensures that appropriate waste streams are split to maximise the opportunity for the recycling of waste. Each core will be provided with a residential waste store at ground floor level, to deposit their segregated waste. Appropriate waste collection methods have been devised also.
- For the full details please refer to the Operational Waste Management Strategy report prepared by Velocity which should be read in conjunction with this report.

Air Quality

- The Air Quality Assessment Addendum, prepared by Ardent Consulting, has been carried out to determine whether the development is 'air quality neutral' in terms of transport and building emissions, including a construction dust risk assessment as part of the report. The report confirms that by following the recommended mitigation measures,

such as Dust Management Plan, the risk of construction phase impacts would reasonably be reduced to negligible, and therefore would be expected to comply with all relevant Air Quality policy.

- For the full details please refer to the Air Quality Assessment Addendum prepared by Ardent Consulting which should be read in conjunction with this report.

Ecology

- Greengage have outlined in their Preliminary Ecological Appraisal the mitigation measures to minimise the impact on local biodiversity, as well as outlining potential enhancements which can be made to the site to promote biodiversity
- Greengage confirm the provision of a biodiverse green roof, green walls, as well as wildlife friendly landscaping and bird boxes. It also outlines a mitigation strategy to minimise damage to the local wildlife through the timing of works, removal of roosting features by hand, and implementing replacement roosts into the fabric of the new building
- The Arboricultural Impact Assessment confirms that the proposed revised development of the site has the potential to have an impact on the Arboricultural value of the site. However, it is deemed that the losses are unavoidable in the plan. The proposed works will require the removal of some trees, including 1 high value category A and 4 moderate value category B trees. The loss of trees will also be offset by the planting of circa 48 new trees
- For the full details please refer to the Preliminary Ecological Appraisal prepared by Greengage and Middlemarch's Arboricultural Impact Assessment which should be read in conjunction with this report.

Noise

- Conditions 21 and 22 require further details on the sound insulation scheme and building services plant prior to the occupation of each phase to be submitted and approved in writing by the LPA. This will accord with the principles set out in the Outline Noise Assessment prepared by Spectrum acoustic consultants
- For the full details please refer to the Outline Noise Assessment prepared by Spectrum which should be read in conjunction with this report.



1.00 INTRODUCTION

1.01 Purpose of Report

This Energy and Sustainability Statement has been prepared by Watkins Payne on behalf of the London Borough of Hillingdon ('LBH') in support of a reserved matters application for Land at Avondale Drive, pursuant to Condition 1 of the hybrid permission for the site. A Section 73 application (application ref: 76551/APP/2025/2861) is currently pending and will be determined prior to the approval of this Reserved Matters Application. Therefore, this RMA responds to the revised wording of the planning conditions proposed within the Section 73 application. which is set out in Condition 34:-.

Condition 34 Prior to the commencement (except for demolition, ground and enabling works) for each relevant development phase of the outline area of the development hereby approved, a detailed energy assessment shall be submitted to and approved by the London Borough of Hillingdon. The assessment shall set out the plans and specifications for the 'be clean' and 'be green' technology solutions set out in the outline energy strategy. The details shall include type, size and location of the air source heat pumps including an appraisal of the associated noise and vibration. The scheme shall details the type and size of PV panels including their pitch and orientation. The assessment shall then ensure there is clear presentation of the reduction in carbon associated with the 'be lean', 'be clean' and 'be green' including making a clear allowance for the electricity demand of the air source heat pumps. Any carbon emissions identified shall be subject to an offsite contribution. The development must proceed in accordance with the approved plans and specification and evidence of this shall be submitted for approval in writing to the Local Planning Authority.

REASON
To ensure the development achieves zero carbon in accordance with Policy SI2 of the London Plan."

This document presents the energy and sustainability strategy for the proposed development in line with the energy hierarchy and the local planning policies outlined in the London Borough of Hillingdon Local Plan.

The purpose of the report is to demonstrate how carbon savings are maximised at all stages of the energy hierarchy, in line with both regional and local planning requirements. It also assesses the suitability of low and zero carbon (LZC/renewable) technologies for the development, taking into account technical feasibility, space constraints, commercial viability, environmental impact as well as long term maintenance and associated costs. Furthermore, it demonstrates how the relevant sustainability-related planning policies have been addressed for the proposed scheme.

1.02 Existing Site

The Site occupies the majority of the Avondale Drive Estate comprising Phases 1b and 2 (Development Zones 2 and 3) of the wider masterplan. The original wider estate consists of three 13-storey blocks of flats containing 144 homes in total, all of which are two bedroom homes. This RMA follows the completion of Phase 1a, new apartment building of 30 homes, located at the western end of the estate.

The surrounding area generally comprises two to three storey residential dwellings (including that to the southern side of Avondale Drive); Hitherbroom Park is located to the north of the site and Minet Infant School is located to the west.

1.03 Proposed Development

The proposed development is described as follows:

Submission of Reserved Matters Application (Access, Appearance, Landscaping, Layout and Scale) pursuant to Condition 1 of Application ref: 76551/APP/2025/2861 (Outline permission (with all matters reserved) for residential floorspace (Class C3) including demolition of all existing buildings and structures;

erection of new buildings; new pedestrian and vehicular accesses; associated amenity space, open space, landscaping; car and cycle parking spaces; plant, refuse storage, servicing area and other works incidental to the proposed development;) for the erection of dwellings with associated landscaping, amenity space, parking, access and associated works.



Site location of Avondale Drive Estate

The proposed development comprises the following GIA floor areas, as per PRP Architects area schedule:

Unit		Floor Area (m² GIA)
Avondale Drive	Phase 1B + 2 – Social Rent	14,733m²
	Phase 1B + 2 – Private	12,534m²
	Development Total	27,267m²

Table 3 | Floor area schedule

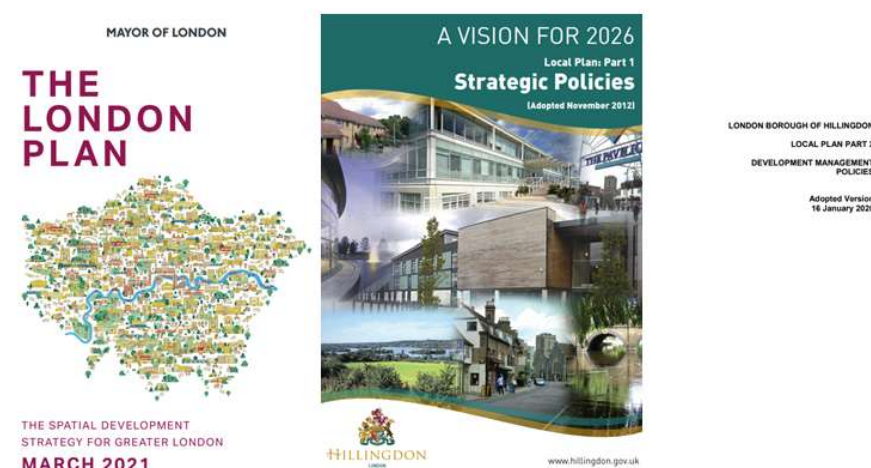


Proposed Site Plan (Credit: PRP Architects)

2.00 POLICY REVIEW AND CONTEXT

Multiple layers of energy and carbon targets apply to this scheme at national, regional and local level, these include:

- The London Plan (March 2021), which is produced by the Mayor of London and is the overall strategic plan for London
- Hillingdon Local Plan, reducing carbon dioxide (CO₂) emissions and adapting to future climate change are key issues for the borough this includes:
 - The Local Plan: Part 1 – Strategic Policies (“LPP1”) (November 2012)
 - The Local Plan: Part 2 – Development Management Policies (“LPP2”) (January 2020)
- Other considerations:
 - National Planning Policy Framework (NPPF) (2025)
 - National Planning Practice Guidance (PPG)



The local policy for Hillingdon (Hillingdon Local Plan Part 1 and Part 2) seeks to ensure that all new residential developments are built in line with the London Plan and Building Regulations to reach zero carbon by 2016.

Under London Plan 2021 Policy SI 2 ‘Minimising greenhouse gas emissions’, the London Plan requires major developments and domestic schemes to achieve zero carbon status with a minimum on-site CO₂ emissions reduction of 35% from that required for compliance with Part L of the 2013 Building Regulations. This policy states that the development proposals should make the fullest contribution to minimising greenhouse gas emissions in accordance with the following energy hierarchy:

1. Be lean: use less energy
2. Be clean: exploit local energy resources and supply energy efficiently
3. Be green: maximise renewable energy by producing, storing and using onsite
4. Be seen: monitoring of energy demand and greenhouse gas emissions

Policy SI 3 Energy Infrastructure. This states that major development proposals within Heat Network Priority areas should have a communal low-temperature heating system following the hierarchy below:

- Connection to existing or planned heat network
- Use zero emissions of local secondary heat sources (heat pumps)
- Use low emission CHP
- Use Ultra-Low NO_x gas boilers

Policy SI 2 Minimising greenhouse gas emissions

- A Major development should be net zero-carbon.¹⁵¹ This means reducing greenhouse gas emissions in operation and minimising both annual and peak energy demand in accordance with the following energy hierarchy:
- 1) be lean: use less energy and manage demand during operation
 - 2) be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly
 - 3) be green: maximise opportunities for renewable energy by producing, storing and using renewable energy on-site
 - 4) be seen: monitor, verify and report on energy performance.

Figure 1: Extract from London Plan

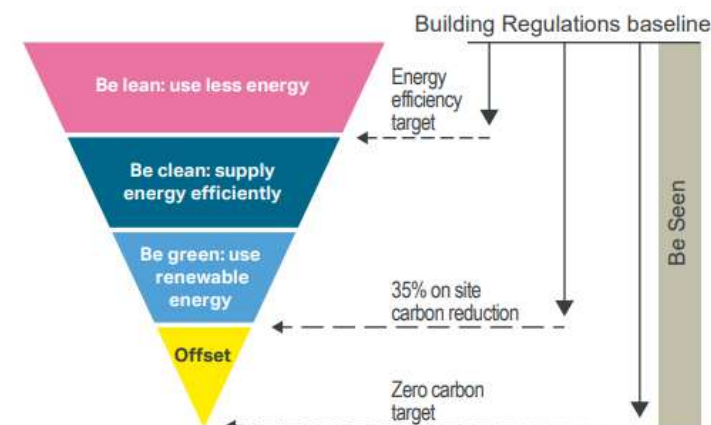


Figure 2: Energy hierarchy by importance



3.00 ENERGY STRATEGY TARGETS

The energy strategy has been developed in line with the energy hierarchy, following the Lean, Clean, Green approach. In line with the Bracknell Forest Council there is no specific minimum carbon reduction target.

The targeted regulated CO₂ savings for the proposed development relative to the Building Regulations Part L Volume 2 (2021) compliant baseline development are as follows:

- **Lean scheme:** Focuses on reducing regulated energy demand and associated carbon emissions through energy efficiency measures alone. The development should also demonstrate that cooling and heating demands are lower than the baseline values.
- **Clean scheme:** While no specific carbon savings are required at this stage, developments are encouraged to connect to existing or planned low-carbon heat networks where viable, or to provide efficient communal heating systems.
- **Green scheme:** Aims to maximise on-site renewable energy generation to reduce regulated carbon emissions. While no specific minimum carbon savings are required at this stage, developments are encouraged to work towards maximising the CO₂ reduction as much as possible relative to the Part L compliant baseline development.

3.01 NOTIONAL ENERGY DEMAND

The baseline energy demands will be calculated at Detailed Design Stage so that is specific to the development. In line with the energy guidance of the London Plan for new build developments the notional dwelling and building form the be lean stage of the hierarchy.

The Target Emission Rate (TER) for the notional building will be produced by applying the current notional building /dwelling specification form Part L and applying it to a building the same size and shape as the proposed development. In line with the London Plan SAP 10 carbon emission factors have been used.



4.00 BE LEAN – ENERGY DEMAND REPORTING

The sections below show a breakdown of the energy demand for space heating, ventilation, lighting and domestic hot water following the implementation of energy efficiency measures under the lean scheme. Details of the general servicing strategy and proposed ‘be lean’ measures can be found in ‘Supporting Information’ of this report (Appendix A).

Where possible passive design measures have been incorporated, including:

- Improvements to the U-values for all building elements when compared with the limiting values of Part L of the Building Regulations.
- Improved airtightness compared to Part L. Most fabric parameters are better than the notional specification. There is a budgetary trade-off between increasing wall versus window performance.
- Residential window area to wall percentage is approximately 35%.

Active design measures have been applied to the scheme include:

- Energy efficient lighting throughout.
- Energy efficiency mechanical ventilation systems with heat recovery above the notional specification.

	Part L1A (2013) Minimum Performance	Part L1A (2013) Notional Performance	Proposed Building Performance
Construction Element	U Value W/m² K		U Value W/m² K
Ground Floor	0.25	0.13	0.11
External Wall	0.30	0.18	0.15
Roof	0.20	0.13	0.11
Windows	2.0	1.4	1.20
	Infiltration (m³/hr.m² at 50Pa)		Infiltration (m³/hr.m² at 50Pa)
Air Tightness	10	5	3.0

Table 4 | Comparison of domestic development fabric specification versus the Building Regulations

The “Be Lean” measures include Mechanical Ventilation with Heat Recovery fitted as standard to every Apartment. An indicative layout is shown below.

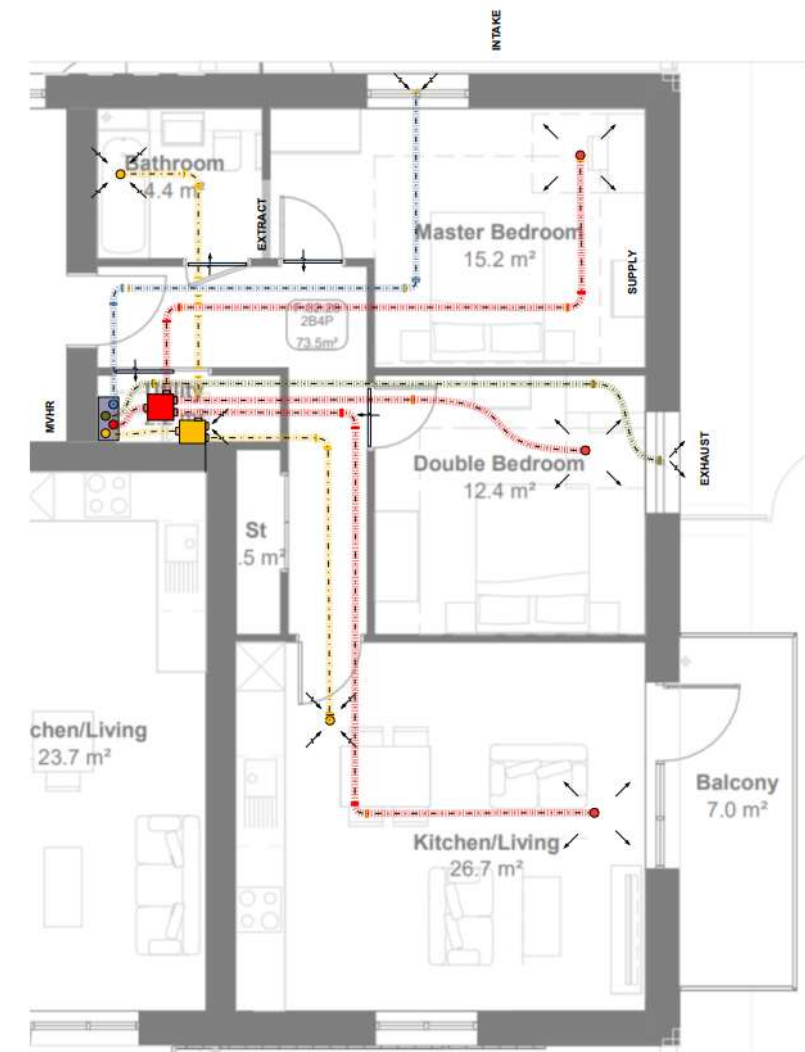


Figure 3: MVHR Layout for Typical Flat



4.01 Development

The overall reduction in regulated energy demand resulting from energy efficient measures, when compared to the Part L compliant baseline development based on notional specifications for existing buildings, is a compliant 30%.

4.02 Be Lean Results

	Carbon Dioxide Emissions (Tonnes CO ₂ per annum)	
	Regulated	Unregulated
Baseline	251.4	5.45
After energy demand reduction (be lean)	175.0	5.45

Table 5 | Be Lean CO₂ emissions results

	Regulated residential carbon dioxide savings	
	Tonnes CO ₂ per annum	%
Be lean: savings from energy demand reduction	76.4	30%

Table 6 | Be Lean CO₂ savings results

4.03 Overheating

With regards to overheating an in depth study has been carried out during the RMA design stage to feed into the layouts and elevation design to ensure compliance with the overheating hierarchy set out within Building Regulations Part O. This also aligns with the planning condition 24 below.

Prior to commencement of superstructure works of any relevant phase of this development, the final Overheating Strategy shall be submitted to and approved in writing by the Local Planning Authority. The submission shall demonstrate how the development will reduce the potential for internal overheating and reliance on air conditioning systems in accordance with the following cooling hierarchy:

- 1) reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure;
- 2) minimise internal heat generation through energy efficient design;
- 3) manage the heat within the building through exposed internal thermal mass and high ceilings;
- 4) provide passive ventilation;
- 5) provide mechanical ventilation;
- 6) provide active cooling systems; and
- 7) Control heating within communal areas.

The approved details shall thereafter be implemented and retained for the lifetime of the development

Dynamic thermal simulation modelling has been undertaken using EDSL TAS (version 9.5.7) for a representative sample of apartment and duplex units across Phases 1b and 2 (Blocks B to F) covering 54% of the total proposed dwellings. The sample selection encompasses all typologies and orientations across multiple floor levels, including those located in the most heat sensitive areas. All communal areas, including internal corridors, staircores and entrance lobbies, were also assessed to evaluate performance against CIBSE TM59 overheating criteria.

Summary of Results

Residential Units

Across Phases 1b and 2, the overheating assessment demonstrates a clear progression in performance through the application of the London Plan cooling hierarchy. Under the baseline natural ventilation scenario, 81% of sampled residential units achieve full compliance with TM59, increasing to 93% with targeted MVHR boost ventilation. With the proposed MVHR cooling coil strategy in place, full compliance is achieved across all sampled units. These results confirm that the proposed design delivers an effective and policy-compliant approach to managing overheating risk across the development.

	TM59 Compliance Summary DSY1 – Development						
	Block					Development	
	B	C	D	E	F		
Baseline	14/19	17/18	15/17	49/52	21/38	116/144	81%
Targeted MVHR Boost	18/19	17/18	16/17	50/52	33/38	134/144	93%
Beneficial Cooling	19/19	18/18	17/17	52/52	38/38	144/144	100%



5.00 BE CLEAN – HEATING INFRASTRUCTURE

5.01 General

The potential use of site-wide heat networks for the development has been assessed in relation to the following:

- Connection to an area wide heat network
- Communal heating system
- Individual heating system

5.02 Connection to an area wide heat network

Investigations into site-wide heat networks has established that there is no available infrastructure arrangement within a reasonable distance from the development site.

As can be seen from the London Heat Map below, the proposed development is around 1,200m from a proposed district heating network, but it is understood that this is unlikely to be available in the near future. LBH LPP2 Policy DMEI 3 asks that a major development needs to confirm no DEN within 500m or required to come forward within 3 years but nonetheless the proposed strategy seeks to future proof the development so is considered to be policy compliant.

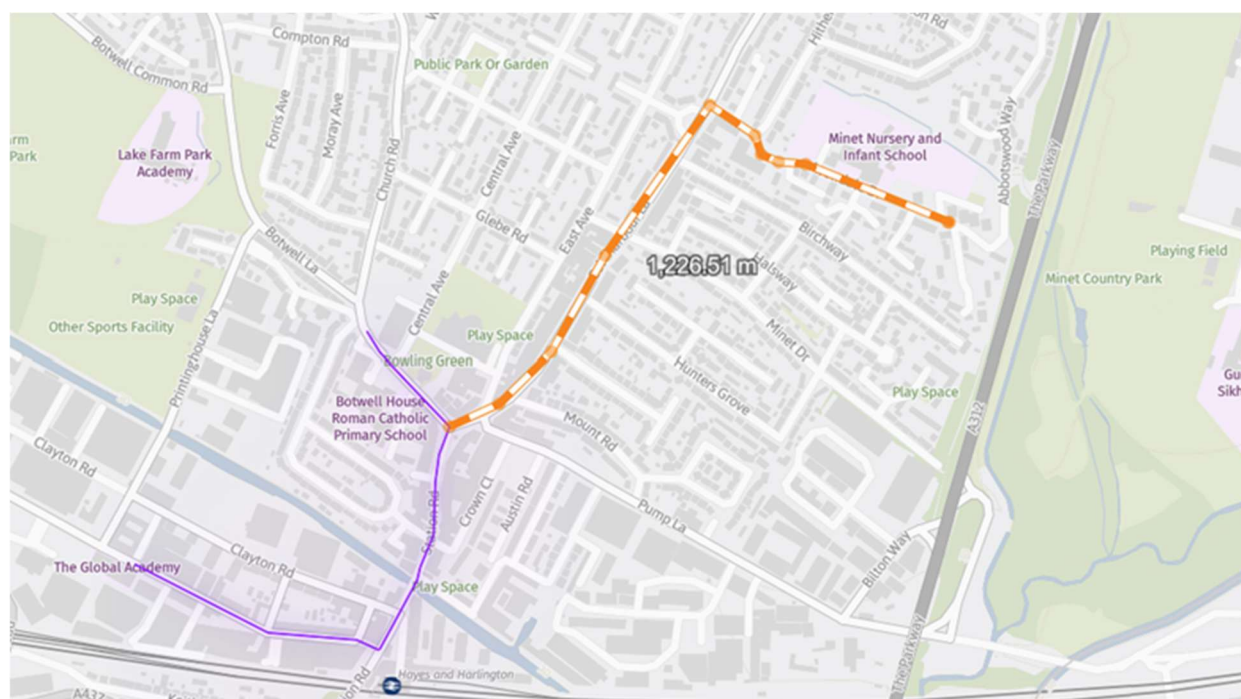


Figure 4: Heat Map for Avondale Drive Estate

As the proposed heating strategy (see Be Green section) is based on central plant (central, roof-mounted heat pumps) rather than individual heating systems for each apartment, it would be very straightforward to swap the heat generating equipment for a District Heating Substation at any point in the future, should a DHN ever be installed nearby and should it be demonstrated to be feasible and viable at that point in time. To that end, the scheme allows for 2 No. 100mm diameter ducts into the plantroom – to minimise future groundworks/trenching – and sufficient space for a 75KW DHN substation in the plantroom itself.

CHP is not proposed for this development and is no longer endorsed by the GLA. In line with the requirements of the London Plan, where heat pumps are used as part of a building heating network then the carbon savings attributed to their use should be included under the Be Clean stage of the energy hierarchy.

5.03 Communal Heating System

The proposed development will be served by high efficiency air source heat pumps (ASHPs) providing heating and hot water to all aspects of the development. The ASHPs will be powered by renewably sourced electricity derived from the grid resulting in minimum carbon emissions being produced.

The ASHP systems will be of the latest type which reduces the volume of refrigerant required within the system, whilst using refrigerants of lower Global Warming Potential (GWP).

5.04 Individual Heating System

The development's heating and cooling systems proposed are in line with guidance hierarchy and therefore individual heating systems are not considered any further for this development.

5.05 Be Clean Results

	Carbon Dioxide Emissions (Tonnes CO ₂ per annum)	
	Regulated	Unregulated
Baseline	251.4	5.45
After energy demand reduction (be lean)	175.0	5.45
After heat network connection (be clean)	175.0	5.45

Table 7 | Be Clean CO₂ emissions results

	Regulated residential carbon dioxide savings	
	Tonnes CO ₂ per annum	%
Be lean: savings from energy demand reduction	76.4	30%
Be clean: savings from heat network	0.0	0%

Table 8 | Be Clean CO₂ savings results



6.00 BE GREEN – RENEWABLE ENERGY TECHNOLOGY

In line with the London Plan 2021 requirements, a feasibility assessment of potential renewable energy technologies has been undertaken, and the results from this are presented below:

Technology	Appraisal	Included in the Development
Air Source Heat Pumps (ASHP)	This Technology is deemed appropriate to provide both space heating and hot water to the residential dwellings – more details can be found in Section 6	YES
Biomass	This technology is not considered a practical solution to reducing greenhouse gas emissions. There is limited storage space for the combustible material alongside accessibility to site for regular deliveries of the materials which in itself has associated greenhouse gas emissions. Local air quality will also be adversely affected by the combustion of the biomass material.	NO
Ground Source Heat Pumps (GSHP)	This technology is deemed not appropriate as air source heat pumps has already incorporated into the scheme.	NO
Photovoltaics (PV)	As detailed below, the use of PV panel is appropriate for this scheme. PV panel installation has been maximised to achieve net zero carbon in conjunction with ASHP. Full details of the proposed PV arrays, areas, locations, and outputs are set out below.	YES
Solar Thermal Hot Water	Whilst this technology is technically feasible, this technology has been rejected on the basis that hot water produced by the Solar Hot Water Panel would compete with the ASHP system. In additional, the Solar Hot Water Panels would also compete for Roof Space with the PV panels which we have considered a more appropriate use of the roof space. Therefore, this technology is therefore rejection.	NO
Wind Turbines	This technology was rejected on the basis of its potential impact on visual amenity and relatively low efficiency from unpredictable, turbulent wind conditions in urban locations	NO

Table 9 | LZC feasibility study

6.01 Air Source Heat Pumps

An air source heat pump (ASHP) works on the same principles as a ground source heat pump (GSHP) however the medium in which heat is extracted is the external air rather than the ground. ASHP will generally have a slightly lower seasonal coefficient of performance when compared to GSHP.

Associated pipework will be sufficiently insulated and where routed externally traced heated in order to ensure that the system runs efficiently and that's losses are minimised.

In order to ensure that the systems are operated as efficiently as possible, end users will be provided with information relating to the control and operation of the system. The performance of the system will be monitored post construction to see that the required level of efficiency is achieved.

Air source heat pumps are suitable for use in the proposed development. They will provide the heating and hot water for all dwellings. Efficiencies used for the system can be seen within the table at the end of this section.

Heat Network	
Heat Network Type	Space and Water Separate
Heat Source 1	
Source	Heat Pump
Heating Use	Space
Efficiency	330
Heating Controls	Flat rate charging, programmer and at least two room thermostats
Heat Source 2	
Source	Heat Pump
Heating Use	Water
Efficiency	440
Water Heating	
Hot Water System	Via heat network

Table 10 | proposed heating and hot water system

6.02 Photovoltaic Panels

It is proposed that PV Panels will be used to extensively on the roof in conjunction with green roof in order to deliver significant carbon reductions.

The use of PV does not conflict with the heat pumps or any of the technology proposed for this scheme. In periods of hot sunny weather, energy generated by the PV can be consumed by the centralised heat pump which for some of the day would be working in hot water generating /air tempering mode after the hot water buffers have been depleted by the high period of use in the morning.



With the proposed installation both Heat Pumps and PV panels alongside measures set out at 'Be Lean' Stage it is expected that a carbon reduction of at least 80% is achieved for 'Be Green' stage.

In order to maximise carbon reductions on site, it will be necessary to maximise the number and PV panels in a south facing arrangement to achieve maximum roof coverage. This is shown in PRP Architect's Roof layout.



6.03 Be Green Results

	Carbon Dioxide Emissions (Tonnes CO ₂ per annum	
	Regulated	Unregulated
Baseline	251.4	5.45
After energy demand reduction (be lean)	175.0	5.45
After heat network connection (be clean)	175.0	5.45
After renewable energy (be green)	29.2	5.45

Table 11 | Be Green Co₂ emissions results

	Regulated residential carbon dioxide savings	
	Tonnes CO ₂ per annum	%
Be lean: savings from energy demand reduction	76.4	30%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	145.8	58%
Cumulative on-site savings	222.2	88%

Table 12 | Be Green Co₂ savings results

7.00 BE SEEN – DEMAND REDUCTION – ENERGY EFFICIENCY

Energy Performance monitoring will be provided in accordance with the London Plan (2021). Note: to facilitate the actual data collection, post-handover both the Electricity input and heat output of the Heat Pumps will be recorded. When this is combined with the readings from individual heat meter, domestic hot water meter and secondary electric heating circuit in each flat, it should make it easy to calculate useful data such as: actual SCOP in use vs MCS certificate figures, standing losses between central plant and flats, real world domestic hot water consumption, real world heating patterns of use.

The spreadsheet is for ease of reference; the data therein is separately uploaded to the GLA reporting website.

Note: the circulation spaces / cores are unheated and will have less than 5% of the development energy consumption, therefore they have been excluded on a de-minimis basis.



8.00 CARBON REDUCTION CONCLUSION

The annual CO₂ emission rates (per m² of floor area) and percentage savings in regulated CO₂ emissions under the baseline, lean and green schemes for the development are detailed below.

DEVELOPMENT	Annual CO ₂ Emissions (TonnesCO ₂ /year)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	251.4	5.45
After energy demand reduction (be lean)	175.0	5.45
After heat network connection (be clean)	175.0	5.45
After renewable energy (be green)	29.2	5.45

The annual savings in regulated CO₂ emissions (in tonnes per annum) are shown below.

DEVELOPMENT	Annual Regulated CO ₂ Savings	
	TonnesCO ₂ /year	% Improvement
Be lean: savings from energy demand reduction	76.4	30%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy (over lean)	145.8	58%
Total cumulative on-site savings (over baseline)	222.2	88%

Summary

The reduction in regulated CO₂ emissions for the overall development under each scheme is summarised below.

Be Lean	30% reduction	An overall 30% reduction in regulated carbon emissions over the Part L 2021 Building Regulations Compliant Development.
Be Clean	0% reduction	No carbon emission reductions achieved at this stage.
Be Green	58% reduction	An overall 58% reduction in regulated carbon emissions over the Part L 2021 Building Regulations Compliant Development.

The energy strategy for Avondale Drive Estate achieves an overall 88% reduction in regulated CO₂ emissions against the Part L compliant baseline.

In alignment with The London Plan and Hillingdon's Local Plan, the energy strategy has made the fullest contribution to minimising energy demand, maximising on-site carbon savings and making the fullest contribution to the efficient supply of energy through renewable technologies. The strategy has maximised all technically and economically viable energy efficiency measures, including:

- Enhanced building fabric performance (meeting or surpassing Part L standards)
- Low g-value glazing to reduce solar gains
- High-efficiency mechanical and electrical services
- Installation of circa 483No. of photovoltaic solar panels to support on-site electricity generation.

These measures collectively ensure that the development achieves the fullest possible contribution toward a low-carbon, energy-efficient refurbishment, while remaining compliant with National and Local Plan policies.



9.00 SUSTAINABILITY METHODOLOGY AND MATRIX

The sustainability appraisal will use the relevant policies pertinent to this report as a framework for demonstrating compliance.

Statement Key

Colour Coding	Planning Policy
	London Borough of Hillingdon Local Plan Part 1 – Strategic Policies (Adopted 2012)
	London Borough of Hillingdon Local Plan Part 2 – Development Management Policies (Adopted 2020)

The compliance of the development is noted using the following colour coding system in the fourth column.

Colour Coding	Compliance Status
	Achieved policy requirements
	Not achieved policy requirements due to constraints
	Not compliant with policy requirements
	Policy requirements not applicable to the development



Climate Change Adaptation and Mitigation	Hillingdon Local Plan Part 1 – Strategic Policies (Adopted 2012)	Review of Proposed Development	Compliance Status
The Council will ensure that climate change mitigation is addressed at every stage of the development process by: 1. Prioritising higher density development in urban and town centres that are well served by sustainable forms of transport. 2. Promoting a modal shift away from private car use and requiring new development to include innovative initiatives to reduce car dependency. 3. Ensuring development meets the highest possible design standards whilst still retaining competitiveness within the market. 4. Working with developers of major schemes to identify the opportunities to help provide efficiency initiatives that can benefit the existing building stock. 5. Promoting the use of decentralised energy within large scale development whilst improving local air quality levels. 6. Targeting areas with high carbon emissions for additional reductions through low carbon strategies. These strategies will also have an objective to minimise other pollutants that impact on local air quality. Targeting areas of poor air quality for additional emissions reductions. 7. Encouraging sustainable techniques to land remediation to reduce the need to transport waste to landfill. In particular developers should consider bioremediation as part of their proposals. 8. Encouraging the installation of renewable energy for all new development in meeting the carbon reduction targets savings set out in the London Plan. Identify opportunities for new sources of electricity generation including anaerobic digestion, hydroelectricity and a greater use of waste as a resource. 9. Promoting new development to contribute to the upgrading of existing housing stock where appropriate. The Borough will ensure that climate change adaptation is addressed at every stage of the development process by: 10. Locating and designing development to minimise the probability and impacts of flooding. 11. Requiring major development proposals to consider the whole water cycle impact which includes flood risk management, foul and surface water drainage and water consumption. 12. Giving preference to development of previously developed land to avoid the loss of further green areas 13. Promoting the use of living walls and roofs, alongside sustainable forms of drainage to manage surface water run-off and increase the amount of carbon sinks . 14. Promoting the inclusion of passive design measures to reduce the impacts of urban heat effects.	Policy EM 1	Markides Associates have prepared a Transport Assessment Addendum for the proposed site, which will encourage access via sustainable modes of transportation. For example, 316 cycle parking spaces will be constructed in phase 1B, with an additional 187 in phase 2. The proposal has considered the whole water cycle impact, including flood risk management, foul and surface water drainage and water consumption through the commissioning of a flood risk assessment and a sustainable drainage strategy. The preliminary ecological appraisal prepared by Greengage confirms the provision of a biodiverse green roof, green walls, as well as wildlife friendly landscaping and bird boxes.	
Flood Risk Management	Hillingdon Local Plan Part 1 – Strategic Policies (Adopted 2012)	Review of Proposed Development	Compliance Status
The Council will require new development to be directed away from Flood Zones 2 and 3 in accordance with the principles of the National Planning Policy Framework (NPPF). The subsequent Hillingdon Local Plan: Part 2 -Site Specific Allocations LDD will be subjected to the Sequential Test in accordance with the NPPF. Sites will only be allocated within Flood Zones 2 or 3 where there are overriding issues that outweigh flood risk. In these instances, policy criteria will be set requiring future applicants of these sites to demonstrate that flood risk can be suitably mitigated. The Council will require all development across the borough to use sustainable urban drainage systems (SUDS) unless demonstrated that it is not viable. The Council will encourage SUDS to be linked to water efficiency methods. The Council may require developer contributions to guarantee the long term maintenance and performance of SUDS is to an appropriate standard	Policy EM 6	The Flood Risk Assessment (FRA) prepared by Whitby Wood. Environment Agency Flood Map for Planning indicates the site is entirely located within Flood Zone 1, corresponding to less than a 1 in 1000 annual probability of flooding from rivers or the sea. The site is considered to be at very low risk from all other sources of flooding: tidal, surface water, sewers, groundwater, reservoirs and other artificial sources. A detailed drainage layout and hydraulic calculations incorporating a climate change allowance of 25% have been prepared to support this approach. A sensitivity check based on a 40% allowance has also been undertaken and indicates no off-site flooding. The FRA has been supported by the Drainage Strategy Addendum prepared by Iesis Structures, which outlines the sustainable drainage proposals for the site. The surface water drainage strategy proposes 4 attenuation tanks, and two private networks of surface water sewers which run adjacent to the proposed buildings to provide collection points for rainwater pipes and surface runoff from the properties, and connections to channel drains and yard gullies within the landscaped areas of the development to serve surface water runoff.	



Biodiversity and Geological Conservation [Extract]	Hillingdon Local Plan Part 1 – Strategic Policies (Adopted 2012)	Review of Proposed Development	Compliance Status
Hillingdon's biodiversity and geological conservation will be preserved and enhanced with particular attention given to: 3. The protection and enhancement of populations of protected species as well as priority species and habitats identified within the UK, London and the Hillingdon Biodiversity Action Plans. 4. Appropriate contributions from developers to help enhance Sites of Importance for Nature Conservation in close proximity to development and to deliver/ assist in the delivery of actions within the Biodiversity Action Plan. 5. The provision of biodiversity improvements from all development, where feasible. 6. The provision of green roofs and living walls which contribute to biodiversity and help tackle climate change. 7. The use of sustainable drainage systems that promote ecological connectivity and natural habitats.	Policy EM 7	The Preliminary Ecological Appraisal (PEA) prepared by Greengage confirms the provision of a biodiverse green roof, green walls, as well as wildlife friendly landscaping and bird boxes. It also outlines a mitigation strategy to minimise damage to the local wildlife through the timing of works, removal of roosting features by hand, and implementing replacement roosts into the fabric of the new building. The Arboricultural Impact Assessment prepared by Middlemarch confirms that the proposed revised development of the site has the potential to have an impact on the arboricultural value of the site. However, it is deemed that the losses are unavoidable in the plan. The proposed works will require the removal of some trees, including 1 high value category A and 4 moderate value category B trees. The loss of trees will also be offset by the planting of circa 48 new trees	

Land, Water, Air and Noise	Hillingdon Local Plan Part 1 – Strategic Policies (Adopted 2012)	Review of Proposed Development	Compliance Status
<u>Water Quality</u> The Council will seek to safeguard and improve all water quality, both ground and surface. Principal Aquifers, and Source Protection Zones will be given priority along with the: River Colne, Grand Union Canal, River Pinn, Yeading Brook, Porter Land Brook, River Crane, Ruislip Lido <u>Air Quality</u> All development should not cause deterioration in the local air quality levels and should ensure the protection of both existing and new sensitive receptors. All major development within the Air Quality Management Area (AQMA) should demonstrate air quality neutrality (no worsening of impacts) where appropriate; actively contribute to the promotion of sustainable transport measures such as vehicle charging points and the increased provision for vehicles with cleaner transport fuels; deliver increased planting through soft landscaping and living walls and roofs; and provide a management plan for ensuring air quality impacts can be kept to a minimum. The Council seeks to reduce the levels of pollutants referred to in the Government's National Air Quality Strategy and will have regard to the Mayor's Air Quality Strategy. London Boroughs should also take account of the findings of the Air Quality Review and Assessments and Actions plans, in particular where Air Quality Management Areas have been designated. The Council has a network of Air Quality Monitoring stations but recognises that this can be widened to improve understanding of air quality impacts. The Council may therefore require new major development in an AQMA to fund additional air quality monitoring stations to assist in managing air quality improvements <u>Noise</u> The Council will investigate Hillingdon's target areas identified in the Defra Noise Action Plans, promote the maximum possible reduction in noise levels and will minimise the number of people potentially affected. The Council will seek to identify and protect Quiet Areas in accordance with Government Policy on sustainable development and other Local Plan policies. The Council will seek to ensure that noise sensitive development and noise generating development are only permitted if noise impacts can be adequately controlled and mitigated. <u>Land contamination</u> The Council will expect proposals for development on contaminated land to provide mitigation strategies that reduce the impacts on surrounding land uses. Major development proposals will be expected to demonstrate a sustainable approach to remediation that includes techniques to reduce the need to landfill. <u>Water Resources</u> The Council will require that all new development demonstrates the incorporation of water efficiency measures within new development to reduce the rising demand on potable water. All new development must incorporate water recycling and collection facilities unless it can be demonstrated it is not appropriate. For residential developments, the Council will require applicants to demonstrate that water consumption will not surpass 105 litres per person per day.	Policy EM 8	<u>Noise</u> Spectrum has been commissioned to undertake an Outline Noise Assessment for the development. The report for Phases 1B and 2, carried out to accompany the s.73 application, indicates that acceptable noise levels can be achieved at the site both internally and in external amenity spaces. Pre-commencement planning conditions 21 and 22 require further details on the sound insulation scheme and building services plant prior to the occupation of each phase to be submitted and approved in writing by the LPA. This will accord with the principles set out in the Noise Assessment and Addendum at outline stage. <u>Air</u> Ardent Consulting have prepared an Air Quality Assessment Addendum for the development. The qualitative construction dust risk assessment shows that the works would be up to High Risk for adverse impacts during construction, in the absence of mitigation. To effectively reduce the risk of impacts to Negligible, appropriate mitigation measures would be adopted. The IAQM's highly recommended mitigation measures for High-Risk sites are provided at section 6 of the report. Implementing these measures, such as Dust Management Plan (DMP) through appropriate planning conditions, should effectively reduce the risk of impacts to Negligible during the construction phase. Therefore, the development would be expected to comply with all relevant Air Quality policy and not be an issue to achieve planning permission. <u>Water</u> The Energy and Sustainability Strategy report prepared by Watkins Payne confirms that all water fixture and fittings will be specified to minimise water consumption. This will include the specification of low flow taps and dual flush toilets. The development will target a water consumption rate of 105l per person per day. A centralised grey water recycling system is deemed financially unviable due to both capital and ongoing maintenance costs. However, to enable owner/occupier with gardens to access rainwater for watering a suitable sized rainwater butt is to be installed. The locations will be shown as part of the RMA submission.	



Sustainable Waste Management	Hillingdon Local Plan Part 1 – Strategic Policies (Adopted 2012)	Review of Proposed Development	Compliance Status
The Council will aim to reduce the amount of waste produced in the Borough and work in conjunction with its partners in West London, to identify and allocate suitable new sites for waste management facilities within the West London Waste Plan to provide sufficient capacity to meet the apportionment requirements of the London Plan which is 382 thousand tonnes per annum for Hillingdon by 2026. The Council will require all new development to address waste management at all stages of a development's life from design and construction through to the end use and activity on site, ensuring that all waste is managed towards the upper end of the waste hierarchy. The Council will follow the waste hierarchy by promoting the reduction of waste generation through measures such as bioremediation of soils and best practice in building construction. The Council will promote using waste as a resource and encouraging the re-use of materials and recycling. The Council will also support opportunities for energy recovery from waste and composting where appropriate. The Council will safeguard existing waste sites unless compensatory provision can be made. The Council will seek to maximise the use of existing waste management sites through intensification or co-location of facilities.	Policy EM 11	Velocity have prepared an Operational Waste Management Strategy (OWMS) report which considers the potential impacts that may arise from waste generated during the operational phase of the Proposed Development, with the overall aim of developing a strategy for legislative compliance and good practice in the separation, storage and collection of waste arising. This strategy has taken into account the need to lessen the overall impact of waste generation through the recycling of materials from the operational phase of the Proposed Development. The proposals set out in this strategy meet the requirements of relevant waste policy and follow applicable guidance. The waste strategy proposed ensures that appropriate waste streams are split to maximise the opportunity for the recycling of waste. Each core will be provided with a residential waste store at ground floor level, to deposit their segregated waste.	
Accessible local destinations	Hillingdon Local Plan Part 1 – Strategic Policies (Adopted 2012)	Review of Proposed Development	Compliance Status
The Council will steer development to the most appropriate locations in order to reduce their impact on the transport network. All development should encourage access by sustainable modes and include good cycling and walking provision. The Council will ensure access to local destinations which provide services and amenities. The Council will promote active travel through improvements to Hillingdon's public rights of way.	Policy T1	Markides Associates have prepared a Transport Assessment (TA) Addendum for the proposed site, which will encourage access via sustainable modes of transportation. The report described the site location and accessibility, undertook an Active Travel Zone (ATZ) assessment, described the development proposals in detail in relation to access, servicing car parking and cycle parking strategies and quantified the anticipated trip generation associated with the proposals. The report concluded that the proposals would not have a material impact on the operation of the local highway network and complied with relevant transport related planning policies. The report confirms that the site is in a very accessible area with a range of established public transport services available which will reduce the impact on Hillingdon's transport network. The TA also confirms that there are a number of local amenities that can be accessed on foot.	



Living Walls and Roofs and on-site Vegetation	Hillingdon Local Plan Part 2 – Development Management Policies (Adopted 2020)	Review of Proposed Development	Compliance Status
All development proposals are required to comply with the following: i) All major development should incorporate living roofs and/or walls into the development. Suitable justification should be provided where living walls and roofs cannot be provided; and ii) Major development in Air Quality Management Areas must provide onsite provision of living roofs and/or walls. A suitable offsite contribution may be required where onsite provision is not appropriate.	Policy DMEI 1	The preliminary ecological appraisal prepared by Greengage confirms the provision of a biodiverse green roof, green walls, as well as wildlife friendly landscaping and bird boxes. The Arboricultural Impact Assessment confirms that the proposed revised development of the site has the potential to have an impact on the Arboricultural value of the site. However, it is deemed that the losses are unavoidable in the plan. The proposed works will require the removal of some trees, including 1 high value category A and 4 moderate value category B trees. The loss of trees will also be offset by the planting of circa 48 new trees	
Reducing Carbon Emissions	Hillingdon Local Plan Part 2 – Development Management Policies (Adopted 2020)	Review of Proposed Development	Compliance Status
A) All developments are required to make the fullest contribution to minimising carbon dioxide emissions in accordance with London Plan targets. B) All major development proposals must be accompanied by an energy assessment showing how these reductions will be achieved. C) Proposals that fail to take reasonable steps to achieve the required savings will be resisted. However, where it is clearly demonstrated that the targets for carbon emissions cannot be met onsite, the Council may approve the application and seek an off-site contribution to make up for the shortfall.	Policy DMEI 2	Markides Associates have prepared a Transport Assessment Addendum for the proposed site, which will encourage access via sustainable modes of transportation. For example, 316 cycle parking spaces will be constructed in phase 1B, with an additional 187 in phase 2. The Transport Assessment Addendum is supported by the Transport Technical Note and Parking Management plan prepared by Markides Associates, which provide further detail as to the parking provision on site. Relevant for reducing carbon emissions, the parking management plan confirms that 20% of allocated car parking spaces are provided with 'active' electric charging infrastructure, with the remaining 80% being provided with 'passive' provision, helping to encourage more sustainable modes of transport	
Decentralised Energy	Hillingdon Local Plan Part 2 – Development Management Policies (Adopted 2020)	Review of Proposed Development	Compliance Status
A) All major developments are required to be designed to be able to connect to a Decentralised Energy Network (DEN). B) Major developments located within 500 metres of an existing DEN, and minor new-build developments located within 100 metres, will be required to connect to that network, including provision of the means to connect to that network and a reasonable financial contribution to the connection charge, unless a feasibility assessment demonstrates that connection is not reasonably possible. C) Major developments located within 500 metres of a planned future DEN, which is considered by the Council likely to be operational within 3 years of a grant of planning permission, will be required to provide a means to connect to that network and developers shall provide a reasonable financial contribution for the future cost of connection and a commitment to connect via a legal agreement or contract, unless a feasibility assessment demonstrates that connection is not reasonably possible. D) The Council will support the development of DENs and energy centres in principle, subject to meeting the wider policy requirements of this plan and in particular on design and air quality.	Policy DMEI 3	The Energy and Sustainability Strategy report prepared by Watkins Payne confirms that there is currently no district heating network that the development can connect to. However, the proposed heating strategy is based on central plan rather than individual heating systems for each apartment, making it straightforward to swap the heat generating equipment for a District Heating Substation at any point in the future, should a decentralised heating network be installed nearby.	



Management of Flood Risk	Hillingdon Local Plan Part 2 – Development Management Policies (Adopted 2020)	Review of Proposed Development	Compliance Status
A) Development proposals in Flood Zones 2 and 3a will be required to demonstrate that there are no suitable sites available in areas of lower flood risk. Where no appropriate sites are available, development should be located on the areas of lowest flood risk within the site. Flood defences should provide protection for the lifetime of the development. Finished floor levels should reflect the Environment Agency's latest guidance on climate change. B) Development proposals in these areas will be required to submit an appropriate level Flood Risk Assessment (FRA) to demonstrate that the development is resilient to all sources of flooding. C) Development in Flood Zone 3b will be refused in principle unless identified as an appropriate development in Flood Risk Planning Policy Guidance. Development for appropriate uses in Flood Zone 3b will only be approved if accompanied by an appropriate FRA that demonstrates the development will be resistant and resilient to flooding and suitable warning and evacuation methods are in place. D) Developments may be required to make contributions (through legal agreements) to previously identified flood improvement works that will benefit the development site. E) Proposals that fail to make appropriate provision for flood risk mitigation, or which would increase the risk or consequences of flooding, will be refused.	Policy DMEI 9	The Flood Risk Assessment (FRA) prepared by Whitby Wood. Environment Agency Flood Map for Planning indicates the site is entirely located within Flood Zone 1, corresponding to less than a 1 in 1000 annual probability of flooding from rivers or the sea. The site is considered to be at very low risk from all other sources of flooding: tidal, surface water, sewers, groundwater, reservoirs and other artificial sources. A detailed drainage layout and hydraulic calculations incorporating a climate change allowance of 25% have been prepared to support this approach. A sensitivity check based on a 40% allowance has also been undertaken and indicates no off-site flooding. The FRA has been supported by the Drainage Strategy Addendum prepared by Iesis Structures, which outlines the sustainable drainage proposals for the site. The surface water drainage strategy proposes 4 attenuation tanks, and two private networks of surface water sewers which will provide sufficient flood risk mitigation.	
Water Management, Efficiency, and Quality	Hillingdon Local Plan Part 2 – Development Management Policies (Adopted 2020)	Review of Proposed Development	Compliance Status
A) Applications for all new build developments (not conversions, change of use, or refurbishment) are required to include a drainage assessment demonstrating that appropriate sustainable drainage systems (SuDS) have been incorporated in accordance with the London Plan Hierarchy (Policy 5.13: Sustainable drainage). B) All major new build developments, as well as minor developments in Critical Drainage Areas or an area identified at risk from surface water flooding must be designed to reduce surface water run-off rates to no higher than the pre-development greenfield run-off rate in a 1:100 year storm scenario, plus an appropriate allowance for climate change for the worst storm duration. The assessment is required regardless of the changes in impermeable areas and the fact that a site has an existing high run-off rate will not constitute justification. C) Rain Gardens and non householder development should be designed to reduce surface water run-off rates to Greenfield run-off rates. D) Schemes for the use of SuDS must be accompanied by adequate arrangements for the management and maintenance of the measures used, with appropriate contributions made to the Council where necessary. E) Proposals that would fail to make adequate provision for the control and reduction of surface water run-off rates will be refused. F) Developments should be drained by a SuDS system and must include appropriate methods to avoid pollution of the water environment. Preference should be given to utilising the drainage options in the SuDS hierarchy which remove the key pollutants that hinder improving water quality in Hillingdon. Major development should adopt a 'treatment train' approach where water flows through different SuDS to ensure resilience in the system. <u>Water Efficiency</u> G) All new development proposals (including refurbishments and conversions) will be required to include water efficiency measures, including the collection and reuse of rain water and grey water. H) All new residential development should demonstrate water usage rates of no more than 105 litres/person/day. I) It is expected that major development proposals will provide an integrated approach to surface water run-off attenuation, water collection, recycling and reuse. Water and Wastewater Infrastructure J) All new development proposals will be required to demonstrate that there is sufficient capacity in the water and wastewater infrastructure network to support the proposed development. Where there is a capacity constraint the local planning authority will require the developer to provide a detailed water and/or drainage strategy to inform what infrastructure is required, where, when and how it will be delivered.	Policy DMEI 10	The Flood Risk Assessment prepared by Whitby Wood. Environment Agency Flood Map for Planning indicates the site is entirely located within Flood Zone 1, corresponding to less than a 1 in 1000 annual probability of flooding from rivers or the sea. The site is considered to be at very low risk from all other sources of flooding: tidal, surface water, sewers, groundwater, reservoirs and other artificial sources. A detailed drainage layout and hydraulic calculations incorporating a climate change allowance of 25% have been prepared to support this approach. A sensitivity check based on a 40% allowance has also been undertaken and indicates no off-site flooding. The FRA has been supported by the Drainage Strategy Addendum prepared by Iesis Structures, which outlines the sustainable drainage proposals for the site. The surface water drainage strategy proposes 4 attenuation tanks, and two private networks of surface water sewers which run adjacent to the proposed buildings to provide collection points for rainwater pipes and surface runoff from the properties, and connections to channel drains and yard gullies within the landscaped areas of the development to serve surface water runoff.	
Air Quality	Hillingdon Local Plan Part 2 – Development Management Policies (Adopted 2020)	Review of Proposed Development	Compliance Status
A) Development proposals should demonstrate appropriate reductions in emissions to sustain compliance with and contribute towards meeting EU limit values and national air quality objectives for pollutants. B) Development proposals should, as a minimum: - be at least "air quality neutral"; - include sufficient mitigation to ensure there is no unacceptable risk from air pollution to sensitive receptors, both existing and new; and - actively contribute towards the improvement of air quality, especially within the Air Quality Management Area.	Policy DMEI 14	Air quality assessment undertaken by Ardent Consulting outlines mitigation measures which will ensure that there is no unacceptable risk from air pollution. IAQM guidance provides in the report outlines the potential mitigation measures to reduce impacts because of fugitive dust emissions during the construction phase. These measures have been adapted for the Site. The AQA determined that following the implementation of appropriate mitigation, the overall residual effects of the Proposed Development would be 'Negligible' and not significant. Markides Associates have prepared a Construction Logistics Plan which support the air quality assessment, detailing the numerous dust and noise suppression measures during construction – including damping down the site to prevent dust	

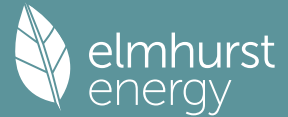


Re-use and Recycling of Aggregates	Hillingdon Local Plan Part 2 – Development Management Policies (Adopted 2020)	Review of Proposed Development	Compliance Status
A) The Council will promote the recycling of construction, demolition and excavation waste. B) All developments will be encouraged to: i) recycle and re-use construction, demolition and excavation waste as aggregates; ii) process and re-use the recyclable material on-site, and where this is not possible, the material should be re-used at another site or for land restoration; and iii) use substitute or recycled materials in new development in place of primary minerals. B) Planning permission for aggregates recycling on active minerals extraction and landfill sites will be supported, subject to local amenity and other policies within the Local Plan. Applications for aggregates recycling sites in other areas such as Strategic Industrial Locations will be required to satisfy other relevant policies in the Local Plan including the West London Waste Plan.	Policy DMIN 4	Velocity have prepared an operational waste management strategy report which considers the potential impacts that may arise from waste generated during the operational phase of the Proposed Development, with the overall aim of developing a strategy for legislative compliance and good practice in the separation, storage and collection of waste arising. This strategy has taken into account the need to lessen the overall impact of waste generation through the recycling of materials from the operational phase of the Proposed Development. The proposals set out in this strategy meet the requirements of relevant waste policy and follow applicable guidance.	



Appendix A – SAP Worksheets for Typical Dwellings

Full SAP Calculation Printout



Plot Reference	00grd sample 1 Plot 01				Issued on Date	13/12/2025	
Assessment Reference	Block B 2B3P W			Plot Type Ref	Block B 2B3P W		
Plot Address					SAP Version	10.2	
SAP Rating	86 B	DER	1.74	TER	13.15		
Environmental	99 A	% DER < TER				86.77	
CO ₂ Emissions (t/year)	0.11	DFEE	34.26	TFEE	32.37		
Compliance Check	See BREL	% DFEE < TFEE				-5.84	
% DPER < TPER	74.88	DPER	18.01	TPER	71.68		
Assessor Details	Mr. Andrew Jones				Assessor ID	N955-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	77.0000		192.5000 (1b) - (3b)
Dwelling volume			192.5000 (4)

2. Ventilation rate

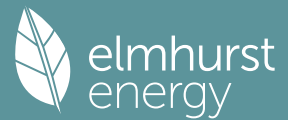
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												86.4000 (23c)
Effective ac	0.2306	0.2274	0.2242	0.2082	0.2051	0.1891	0.1891	0.1859	0.1955	0.2051	0.2114	0.2178 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows Open			13.8300	1.1450	15.8359		(27)
Heat Loss Floor 1			77.0000	0.1100	8.4700	110.0000	8470.0000 (28a)
External Wall 1	51.2500	13.8300	37.4200	0.1500	5.6130	70.0000	2619.4000 (29a)
Total net area of external elements A _{um} (A, m ²)			128.2500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.9189		(33)
Main dwelling							
Party Wall hall			51.2500	0.0000	0.0000	180.0000	9225.0000 (32)
Party Ceilings 1			77.0000			30.0000	2310.0000 (32b)
Internal Wall 1			142.3000			9.0000	1280.7000 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 23905.1000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							310.4558 (35)
Thermal bridges (User defined value 0.075 * total exposed area)							9.6188 (36)
Point Thermal bridges							(36a) = 0.0000
Total fabric heat loss							(33) + (36) + (36a) = 39.5376 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	14.6465	14.4440	14.2415	13.2291	13.0266	12.0142	12.0142	11.8117	12.4191	13.0266	13.4316	13.8365	(38)
Heat transfer coeff	54.1841	53.9816	53.7791	52.7667	52.5642	51.5518	51.5518	51.3493	51.9568	52.5642	52.9692	53.3742	(39)
Average = Sum(39)m / 12 =												52.7161	
HLP	0.7037	0.7011	0.6984	0.6853	0.6827	0.6695	0.6695	0.6669	0.6748	0.6827	0.6879	0.6932	(40)
HLP (average)												0.6846	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.4035 (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	74.3895	73.2847	71.7290	68.8604	66.7124	64.3307	63.0442	64.5891	66.2712	68.8197	71.7474	74.1380	(42b)
Hot water usage for other uses	39.2440	37.8169	36.3899	34.9628	33.5358	32.1087	32.1087	33.5358	34.9628	36.3899	37.8169	39.2440	(42c)
Average daily hot water use (litres/day)												104.6472	(43)
Daily hot water use	113.6335	111.1017	108.1188	103.8232	100.2482	96.4394	95.1529	98.1249	101.2340	105.2096	109.5643	113.3820	(44)
Energy content (annual)	179.9677	158.2073	166.1746	142.1288	134.9534	118.5835	115.0792	121.4991	124.8317	142.7685	156.0944	177.5288	(45)
Distribution loss (46)m = 0.15 x (45)m	26.9952	23.7311	24.9262	21.3193	20.2430	17.7875	17.2619	18.2249	18.7248	21.4153	23.4142	26.6293	(46)
Water storage loss (or HIU loss):													
Store volume												15.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2500	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.1500	(55)
Total storage loss	4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500	(56)
If cylinder contains dedicated solar storage	4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	207.8801	183.4185	194.0870	169.1408	162.8658	145.5955	142.9916	149.4115	151.8437	170.6809	183.1064	205.4412	(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	207.8801	183.4185	194.0870	169.1408	162.8658	145.5955	142.9916	149.4115	151.8437	170.6809	183.1064	205.4412	(64)
12Total per year (kWh/year)												2066.4629	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	82.1692	72.7729	77.5830	68.8674	67.2019	61.0386	60.5938	62.7284	63.1161	69.8004	73.5110	81.3583	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	112.9871	125.0929	112.9871	116.7534	112.9871	116.7534	112.9871	112.9871	116.7534	112.9871	116.7534	112.9871	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	213.0566	215.2674	209.6961	197.8355	182.8636	168.7921	159.3915	157.1806	162.7519	174.6125	189.5845	203.6559	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174	(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)	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	(71)
Water heating gains (Table 5)	110.4424	108.2930	104.2782	95.6492	90.3251	84.7759	81.4432	84.3123	87.6613	93.8178	102.0986	109.3525	(72)
Total internal gains	495.5382	507.7054	486.0136	469.2902	445.2280	429.3734	412.8739	413.5321	426.2187	440.4695	467.4885	485.0477	(73)

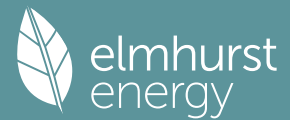
6. Solar gains

[Jan]												Area		Solar flux		g		FF		Access		Gains	
												m2		Table 6a		Specific data		Specific data		factor		W	
												W/m2		or Table 6b		or Table 6c		Table 6d					
Northeast												5.2400	11.2829		0.4000		0.6000		0.7700		9.8333 (75)		
Northwest												8.5900	11.2829		0.4000		0.6000		0.7700		16.1198 (81)		
Solar gains	25.9531	52.8283	95.1797	156.3124	210.1146	224.0044	209.5515	167.0569	115.9780	64.5603	32.6557	21.1946	(83)										
Total gains	521.4913	560.5336	581.1933	625.6026	655.3425	653.3778	622.4254	580.5890	542.1966	505.0299	500.1442	506.2423	(84)										

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	122.5508	123.0105	123.4736	125.8427	126.3275	128.8084	128.8084	129.3164	127.8044	126.3275	125.3616	124.4105	
alpha	9.1701	9.2007	9.2316	9.3895	9.4218	9.5872	9.5872	9.6211	9.5203	9.4218	9.3574	9.2940	
util living area													

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	0.9973	0.9936	0.9822	0.9127	0.7334	0.5046	0.3644	0.4068	0.6568	0.9358	0.9912	0.9978 (86)
MIT	20.5173	20.6083	20.7377	20.9151	20.9896	20.9997	21.0000	21.0000	20.9970	20.9068	20.6975	20.5080 (87)
Th 2	20.3376	20.3399	20.3422	20.3539	20.3562	20.3678	20.3678	20.3702	20.3632	20.3562	20.3515	20.3469 (88)
util rest of house												
	0.9963	0.9913	0.9758	0.8874	0.6873	0.4550	0.3121	0.3511	0.5983	0.9108	0.9876	0.9970 (89)
MIT 2	19.8993	19.9913	20.1196	20.2919	20.3504	20.3677	20.3678	20.3702	20.3619	20.2897	20.0900	19.8982 (90)
Living area fraction									FLA = Living area / (4) =			0.3442 (91)
MIT	20.1120	20.2036	20.3323	20.5064	20.5704	20.5852	20.5854	20.5869	20.5805	20.5021	20.2991	20.1081 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1120	20.2036	20.3323	20.5064	20.5704	20.5852	20.5854	20.5869	20.5805	20.5021	20.2991	20.1081 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9958	0.9908	0.9756	0.8939	0.7029	0.4721	0.3301	0.3703	0.6185	0.9171	0.9872	0.9967	(94)
Useful gains	519.3266	555.3529	567.0385	559.1958	460.6608	308.4272	205.4513	214.9861	335.3271	463.1603	493.7486	504.5624	(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	856.7580	826.1158	743.8909	612.4313	466.2664	308.5496	205.4546	214.9957	336.7042	520.4936	699.1433	849.0804	(97)
Space heating kWh	251.0490	181.9527	131.5782	38.3296	4.1706	0.0000	0.0000	0.0000	0.0000	42.6559	147.8842	256.3214	(98a)
Space heating requirement - total per year (kWh/year)												1053.9414	
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	251.0490	181.9527	131.5782	38.3296	4.1706	0.0000	0.0000	0.0000	0.0000	42.6559	147.8842	256.3214	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1053.9414	
Space heating per m2										(98c) / (4) =		13.6876	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)
Fraction of space heat from community system												1.0000 (302)
Fraction of heat from community Heat pump-Space												1.0000 (303a)
Fraction of heat from community Heat pump-Water												1.0000 (303b)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500 (305)
Distribution loss factor (Table 12c) for community heating system												1.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	251.0490	181.9527	131.5782	38.3296	4.1706	0.0000	0.0000	0.0000	0.0000	42.6559	147.8842	256.3214 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00												
307a	263.6014	191.0503	138.1571	40.2461	4.3791	0.0000	0.0000	0.0000	0.0000	44.7887	155.2784	269.1374
Space heating requirement	263.6014	191.0503	138.1571	40.2461	4.3791	0.0000	0.0000	0.0000	0.0000	44.7887	155.2784	269.1374 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement	207.8801	183.4185	194.0870	169.1408	162.8658	145.5955	142.9916	149.4115	151.8437	170.6809	183.1064	205.4412 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00												
310b	207.8801	183.4185	194.0870	169.1408	162.8658	145.5955	142.9916	149.4115	151.8437	170.6809	183.1064	205.4412
Water heating fuel	207.8801	183.4185	194.0870	169.1408	162.8658	145.5955	142.9916	149.4115	151.8437	170.6809	183.1064	205.4412 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	14.9596	13.5119	14.9596	14.4771	14.9596	14.4771	14.9596	14.9596	14.4771	14.9596	14.4771	14.9596 (331)
Lighting	25.0738	20.1152	18.1115	13.2692	10.2495	8.3740	9.3500	12.1535	15.7861	20.7123	23.3944	25.7707 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-12.0018	-18.4327	-28.8972	-35.5353	-41.0584	-39.3649	-38.8731	-35.2894	-29.5052	-22.3227	-13.7162	-10.2053 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												1106.6384 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2066.4629 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution (space)												11.0664 (313)
Electricity used for heat distribution (water)												2.0544 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)												
mechanical ventilation fans (SFP = 0.7500)												176.1375 (330a)
Total electricity for the above, kWh/year												176.1375 (331)
Electricity for lighting (calculated in Appendix L)												202.3602 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-325.2022 (333)
Wind generation												0.0000 (334)
Hydro-electric generation (Appendix N)												0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (335)
Appendix Q - special features												
Energy saved or generated												-0.0000 (336)
Energy used												0.0000 (337)
Total delivered energy for all uses												3226.3968 (338)

12b. Carbon dioxide emissions - Community heating scheme

Energy	Emission factor	Emissions
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	kWh/year	kg CO2/kWh	kg CO2/year
Efficiency of heat source Heat pump			330.0000 (367)
Space heating from Heat pump	335.3450	0.1576	52.8527 (367)
Efficiency of heat source Heat pump			440.0000 (367)
Water heating from Heat pump	469.6507	0.0000	0.0000 (368)
Electrical energy for heat distribution (space & water)	11.0664	0.0000	4.6598 (372)
Overall CO2 factor for heat network (space)			0.0493 (386)
Overall CO2 factor for heat network (water)			0.0335 (386)
Total CO2 associated with community systems			123.7769 (373)
Space and water heating			123.7769 (376)
Pumps, fans and electric keep-hot	176.1375	0.1387	24.4324 (378)
Energy for lighting	202.3602	0.1443	29.2068 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-325.2022	0.1328	-43.1893
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-43.1893 (380)
Total CO2, kg/year			134.2268 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.7400 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			330.0000 (467a)
Space heating from Heat pump	335.3450	1.5835	531.0101 (467)
Efficiency of heat source Heat pump			440.0000 (467b)
Water heating from Heat pump	469.6507	0.0000	0.0000 (468)
Electrical energy for heat distribution (space & water)	11.0664	0.0000	48.9691 (472)
Overall CO2 factor for heat network (space)			0.4957 (486)
Overall CO2 factor for heat network (water)			0.3611 (486)
Total CO2 associated with community systems			1294.6559 (473)
Space and water heating			1294.6559 (476)
Pumps, fans and electric keep-hot	176.1375	1.5128	266.4608 (478)
Energy for lighting	202.3602	1.5338	310.3868 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-325.2022	1.4907	-484.7892
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-484.7892 (480)
Total Primary energy kWh/year			1386.7143 (483)
Dwelling Primary energy Rate (DPER)			18.0100 (484)

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

1. Overall dwelling characteristics

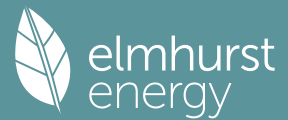
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	77.0000	2.5000	192.5000
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	77.0000		
Dwelling volume			

2. Ventilation rate

		m3 per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1558 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4058 (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) =	0.3450 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000	(22)
Wind factor	1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 0.9500 0.9250 1.0000 1.0750 1.1250 1.1750	(22a)
Adj infilt rate	0.4398 0.4312 0.4226 0.3795 0.3708 0.3277 0.3277 0.3191 0.3450 0.3708 0.3881 0.4053	(22b)
Effective ac	0.5967 0.5930 0.5893 0.5720 0.5688 0.5537 0.5537 0.5509 0.5595 0.5688 0.5753 0.5821	(25)

3. Heat losses and heat loss parameter

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Element	Gross		Openings	NetArea	U-value	A x U	K-value	A x K					
Main dwelling	m2		m2	m2	W/m2K	W/K	kJ/m2K	kJ/K					
TER Opening Type				13.8300	1.1450	15.8359		(27)					
Heat Loss Floor 1				77.0000	0.1300	10.0100		(28a)					
External Wall 1	51.2500		13.8300	37.4200	0.1800	6.7356		(29a)					
Total net area of external elements Aum(A, m2)				128.2500				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =		32.5815		(33)					
Main dwelling													
Party Wall hall				51.2500	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								310.4558 (35)					
List of Thermal Bridges													
K1 Element					Length	Psi-value	Total						
E1 Steel lintel with perforated steel base plate					7.5100	0.0500	0.3755						
E3 Sill					7.5100	0.0500	0.3755						
E4 Jamb					18.0400	0.0500	0.9020						
E16 Corner (normal)					2.5000	0.0900	0.2250						
E7 Party floor between dwellings (in blocks of flats)					20.5000	0.0700	1.4350						
P1 Party wall - Ground floor					20.5000	0.0800	1.6400						
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)					20.5000	0.0000	0.0000						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								4.9530 (36)					
Point Thermal bridges							(36a) =	0.0000					
Total fabric heat loss							(33) + (36) + (36a) =	37.5345 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	37.9071	37.6685	37.4346	36.3361	36.1306	35.1738	35.1738	34.9966	35.5423	36.1306	36.5463	36.9810	(38)
Average = Sum(39)m / 12 =	75.4415	75.2029	74.9691	73.8706	73.6650	72.7083	72.7083	72.5311	73.0768	73.6650	74.0808	74.5155	(39)
												73.8696	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9798	0.9767	0.9736	0.9594	0.9567	0.9443	0.9443	0.9420	0.9490	0.9567	0.9621	0.9677	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	
												31	

4. Water heating energy requirements (kWh/year)													

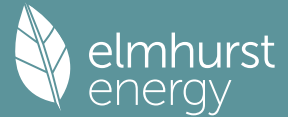
Assumed occupancy													2.4035 (42)
Hot water usage for mixer showers													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
74.3895	73.2847	71.7290	68.8604	66.7124	64.3307	63.0442	64.5891	66.2712	68.8197	71.7474	74.1380	74.1380	(42b)
Hot water usage for other uses													
39.2440	37.8169	36.3899	34.9628	33.5358	32.1087	32.1087	33.5358	34.9628	36.3899	37.8169	39.2440	39.2440	(42c)
Average daily hot water use (litres/day)													104.6472 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
113.6335	111.1017	108.1188	103.8232	100.2482	96.4394	95.1529	98.1249	101.2340	105.2096	109.5643	113.3820	113.3820	(44)
Energy conte	179.9677	158.2073	166.1746	142.1288	134.9534	118.5835	115.0792	121.4991	124.8317	142.7685	156.0944	177.5288	(45)
Energy content (annual)										Total = Sum(45)m =		1737.8169	
Distribution loss (46)m = 0.15 x (45)m													
26.9952	23.7311	24.9262	21.3193	20.2430	17.7875	17.2619	18.2249	18.7248	21.4153	23.4142	26.6293	26.6293	(46)
Water storage loss (or HIU loss):													
Store volume													15.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													0.4337 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.2342 (55)
Total storage loss													
7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	(56)
If cylinder contains dedicated solar storage													
7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
210.4896	185.7755	196.6965	171.6661	165.4753	148.1209	145.6011	152.0210	154.3690	173.2904	185.6318	208.0508	208.0508	(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	210.4896	185.7755	196.6965	171.6661	165.4753	148.1209	145.6011	152.0210	154.3690	173.2904	185.6318	208.0508	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2097.1880	(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	84.2568	74.6585	79.6706	70.8877	69.2895	63.0589	62.6814	64.8160	65.1364	71.8881	75.5313	83.4459	(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	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.7956	121.5594	109.7956	113.4555	109.7956	113.4555	109.7956	109.7956	113.4555	109.7956	113.4555	109.7956	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	213.0566	215.2674	209.6961	197.8355	182.8636	168.7921	159.3915	157.1806	162.7519	174.6125	189.5845	203.6559	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	(71)
Water heating gains (Table 5)	113.2484	111.0989	107.0841	98.4551	93.1311	87.5818	84.2492	87.1183	90.4672	96.6237	104.9046	112.1584	(72)
Total internal gains	498.1527	509.9779	488.6280	471.7982	447.8424	428.8815	412.4884	413.1466	425.7267	443.0840	469.9966	487.6621	(73)

6. Solar gains													

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[Jan]	Area m2				Solar flux Table 6a W/m2	Specific data or Table 6b		Specific data or Table 6c		FF	Access factor Table 6d	Gains W
Northeast	5.2400				11.2829	0.6300		0.7000			0.7700	18.0686 (75)
Northwest	8.5900				11.2829	0.6300		0.7000			0.7700	29.6202 (81)
Solar gains	47.6888	97.0719	174.8927	287.2241	386.0855	411.6080	385.0509	306.9670	213.1095	118.6296	60.0048	38.9451 (83)
Total gains	545.8415	607.0498	663.5207	759.0223	833.9279	840.4895	797.5392	720.1136	638.8362	561.7136	530.0014	526.6072 (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	88.0192	88.2985	88.5739	89.8911	90.1419	91.3281	91.3281	91.5512	90.8675	90.1419	89.6360	89.1131
alpha	6.8679	6.8866	6.9049	6.9927	7.0095	7.0885	7.0885	7.1034	7.0578	7.0095	6.9757	6.9409
util living area	0.9982	0.9957	0.9868	0.9341	0.7749	0.5499	0.4008	0.4623	0.7525	0.9669	0.9953	0.9986 (86)
MIT	20.1420	20.2721	20.4808	20.7775	20.9532	20.9962	20.9996	20.9991	20.9717	20.7315	20.3957	20.1272 (87)
Th 2	20.1002	20.1028	20.1054	20.1173	20.1196	20.1300	20.1300	20.1320	20.1260	20.1196	20.1150	20.1103 (88)
util rest of house	0.9975	0.9940	0.9814	0.9098	0.7174	0.4770	0.3217	0.3757	0.6730	0.9494	0.9930	0.9980 (89)
MIT 2	19.1032	19.2711	19.5370	19.9040	20.0856	20.1283	20.1300	20.1317	20.1099	19.8600	19.4389	19.0921 (90)
Living area fraction	fLA = Living area / (4) = 0.3442 (91)											
MIT	19.4607	19.6156	19.8618	20.2046	20.3842	20.4270	20.4293	20.4302	20.4065	20.1599	19.7682	19.4483 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.4607	19.6156	19.8618	20.2046	20.3842	20.4270	20.4293	20.4302	20.4065	20.1599	19.7682	19.4483 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9967	0.9927	0.9796	0.9125	0.7355	0.5021	0.3490	0.4055	0.6998	0.9504	0.9918	0.9974 (94)
Useful gains	544.0622	602.6266	649.9654	692.6131	613.3321	422.0279	278.3146	292.0297	447.0524	533.8617	525.6702	525.2460 (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	1143.7448	1106.6538	1001.7216	835.0788	639.7196	423.6695	278.4190	292.3172	460.8569	704.2336	938.4706	1136.2369 (97)
Space heating kWh	446.1639	338.7063	261.7066	102.5752	19.6322	0.0000	0.0000	0.0000	0.0000	126.7567	297.2163	454.5773 (98a)
Space heating requirement - total per year (kWh/year)	2047.3345											
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	446.1639	338.7063	261.7066	102.5752	19.6322	0.0000	0.0000	0.0000	0.0000	126.7567	297.2163	454.5773 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2047.3345											
Space heating per m2	(98c) / (4) = 26.5888 (99)											
9a. Energy requirements - Individual heating systems, including micro-CHP												
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Fraction of main heating from main system 2												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												88.8000 (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	446.1639	338.7063	261.7066	102.5752	19.6322	0.0000	0.0000	0.0000	0.0000	126.7567	297.2163	454.5773 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	483.3845	366.9624	283.5391	111.1324	21.2700	0.0000	0.0000	0.0000	0.0000	137.3312	322.0112	492.4998 (211)
Space heating efficiency (main heating system 2)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Water heating												
Water heating requirement	210.4896	185.7755	196.6965	171.6661	165.4753	148.1209	145.6011	152.0210	154.3690	173.2904	185.6318	208.0508 (64)
Efficiency of water heater	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000 (216)
Fuel for water heating, kWh/month	263.7714	232.8013	246.4869	215.1205	207.3625	185.6151	182.4576	190.5025	193.4449	217.1559	232.6213	260.7152 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	11.1260	10.0493	11.1260	10.7671	11.1260	10.7671	11.1260	11.1260	10.7671	11.1260	10.7671	11.1260 (231)
Lighting	22.8134	18.3017	16.4787	12.0730	9.3255	7.6190	8.5071	11.0578	14.3630	18.8450	21.2854	23.4474 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-9.2664	-14.3220	-22.5440	-27.8381	-32.2915	-30.9943	-30.6238	-27.7604	-23.1580	-17.4147	-10.6251	-7.8720 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-2.0079	-4.3971	-9.0752	-14.1426	-19.2164	-19.4972	-19.2637	-16.0664	-11.4657	-6.4451	-2.7295	-1.5750 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

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Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year												
Space heating fuel - main system 1											2218.1306	(211)
Space heating fuel - main system 2											0.0000	(213)
Space heating fuel - secondary											0.0000	(215)
Efficiency of water heater											79.8000	
Water heating fuel used											2628.0551	(219)
Space cooling fuel											0.0000	(221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year											131.0000	(231)
Electricity for lighting (calculated in Appendix L)											184.1169	(232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation											-380.5918	(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											4780.7108	(238)

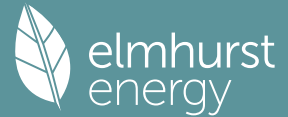
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2218.1306	0.2100	465.8074 (261)
Space heating - main system 2	0.0000	0.2100	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2628.0551	0.2100	551.8916 (264)
Space and water heating			1017.6990 (265)
Pumps, fans and electric keep-hot	131.0000	0.1387	18.1713 (267)
Energy for lighting	184.1169	0.1443	26.5738 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-254.7101	0.1327	-33.8034
PV Unit electricity exported	-125.8816	0.1248	-15.7152
Total			-49.5186 (269)
Total CO2, kg/year			1012.9254 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.1500 (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	2218.1306	1.1300	2506.4875 (275)
Space heating - main system 2	0.0000	1.1300	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2628.0551	1.1300	2969.7023 (278)
Space and water heating			5476.1898 (279)
Pumps, fans and electric keep-hot	131.0000	1.5128	198.1768 (281)
Energy for lighting	184.1169	1.5338	282.4046 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-254.7101	1.4904	-379.6143
PV Unit electricity exported	-125.8816	0.4582	-57.6792
Total			-437.2934 (283)
Total Primary energy kWh/year			5519.4778 (286)
Target Primary Energy Rate (TPER)			71.6800 (287)

Full SAP Calculation Printout



Plot Reference	00grd sample 2 Plot 02				Issued on Date	13/12/2025		
Assessment Reference	Block C 3B5P D			Plot Type Ref	Block C 3B5P D			
Plot Address					SAP Version	10.2		
SAP Rating	86 B		DER	1.90		TER	9.30	
Environmental	98 A		% DER < TER				79.57	
CO ₂ Emissions (t/year)	0.15		DFEE	38.01		TFEE	31.72	
Compliance Check	See BREL		% DFEE < TFEE				-19.83	
% DPER < TPER	59.62		DPER	19.58		TPER	48.50	
Assessor Details	Mr. Andrew Jones				Assessor ID	N955-0001		
Client								

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	48.0000 (1b)	x 2.5000 (2b)	= 120.0000 (1b) - (3b)
First floor	48.0000 (1c)	x 2.8000 (2c)	= 134.4000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	96.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 254.4000 (5)

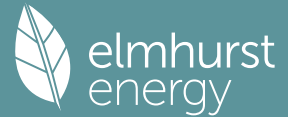
2. Ventilation rate

	m ³ per hour											
Number of open chimneys	0 * 80 = 0.0000 (6a)											
Number of open flues	0 * 20 = 0.0000 (6b)											
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)											
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)											
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)											
Number of blocked chimneys	0 * 20 = 0.0000 (6f)											
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)											
Number of passive vents	0 * 10 = 0.0000 (7b)											
Number of flueless gas fires	0 * 40 = 0.0000 (7c)											
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 0.0000 / (5) = 0.0000 (8)											
Pressure test	Yes											
Pressure Test Method	Blower Door											
Measured/design AP50	3.0000 (17)											
Infiltration rate	0.1500 (18)											
Number of sides sheltered	2 (19)											
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)											
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (21)											
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												85.5000 (23c)
Effective ac	0.2351	0.2319	0.2287	0.2128	0.2096	0.1936	0.1936	0.1904	0.2000	0.2096	0.2159	0.2223 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows Open			22.0900	1.1450	25.2939		(27)
External Door			2.2100	1.2000	2.6520		(26)
Heat Loss Floor 1			48.0000	0.1100	5.2800	110.0000	5280.0000 (28a)
External Wall 1	74.2000	24.3000	49.9000	0.1500	7.4850	70.0000	3493.0000 (29a)
External Roof 1	48.0000		48.0000	0.1100	5.2800	9.0000	432.0000 (30)
Total net area of external elements Aum (A, m ²)			170.2000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.9909		(33)
Main dwelling							
Party Wall hall			74.2000	0.0000	0.0000	180.0000	13355.9995 (32)
Internal Wall 1			347.5000			9.0000	3127.5000 (32c)
Internal Floor 1			48.0000			40.0000	1920.0000 (32d)
Internal Ceiling 1			48.0000			30.0000	1440.0000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	29048.4994 (34)

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Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 302.5885 (35)
Thermal bridges (User defined value 0.075 * total exposed area) 12.7650 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 58.7559 (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	19.7340	19.4664	19.1988	17.8608	17.5932	16.2552	16.2552	15.9876	16.7904	17.5932	18.1284	18.6636 (38)
Heat transfer coeff	80.1319	78.9418	77.2660	74.1760	71.8622	69.2966	67.9108	69.5750	71.3869	74.1322	77.2858	79.8610 (42b)
Average = Sum(39)m / 12 =	78.4899	78.2223	77.9547	76.6167	76.3491	75.0111	75.0111	74.7435	75.5463	76.3491	76.8843	77.4195 (39)
												76.5498
HLP	0.8176	0.8148	0.8120	0.7981	0.7953	0.7814	0.7814	0.7786	0.7869	0.7953	0.8009	0.8065 (40)
HLP (average)												0.7974
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6993 (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												
	80.1319	78.9418	77.2660	74.1760	71.8622	69.2966	67.9108	69.5750	71.3869	74.1322	77.2858	79.8610 (42b)
Hot water usage for other uses												
	42.2734	40.7361	39.1989	37.6617	36.1245	34.5873	34.5873	36.1245	37.6617	39.1989	40.7361	42.2734 (42c)
Average daily hot water use (litres/day)												112.7252 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	122.4053	119.6780	116.4649	111.8377	107.9867	103.8839	102.4981	105.6995	109.0486	113.3311	118.0220	122.1344 (44)
Energy conte	193.8600	170.4199	179.0022	153.1002	145.3709	127.7374	123.9626	130.8780	134.4679	153.7893	168.1439	191.2329 (45)
Energy content (annual)										Total = Sum(45)m =		1871.9651
Distribution loss (46)m = 0.15 x (45)m												
	29.0790	25.5630	26.8503	22.9650	21.8056	19.1606	18.5944	19.6317	20.1702	23.0684	25.2216	28.6849 (46)
Water storage loss (or HIU loss):												
Store volume												15.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												
Temperature factor from Table 2b												0.2500 (48)
Enter (49) or (54) in (55)												0.6000 (49)
Total storage loss												0.1500 (55)
	4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500 (56)
If cylinder contains dedicated solar storage												
	4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
	221.7724	195.6311	206.9146	180.1122	173.2833	154.7494	151.8750	158.7904	161.4799	181.7017	195.1559	219.1453 (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	221.7724	195.6311	206.9146	180.1122	173.2833	154.7494	151.8750	158.7904	161.4799	181.7017	195.1559	219.1453 (64)
Total per year (kWh/year) = Sum(64)m = 2200.6111 (64)												
12Total per year (kWh/year)												2201 (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												
	86.7884	76.8336	81.8482	72.5154	70.6657	64.0823	63.5475	65.8469	66.3202	73.4648	77.5175	85.9149 (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	134.9642	134.9642	134.9642	134.9642	134.9642	134.9642	134.9642	134.9642	134.9642	134.9642	134.9642	134.9642 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	127.0215	140.6310	127.0215	131.2556	127.0215	131.2556	127.0215	127.0215	131.2556	127.0215	131.2556	127.0215 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	249.6943	252.2854	245.7560	231.8558	214.3093	197.8180	186.8008	184.2098	190.7391	204.6393	222.1859	238.6771 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	36.4964	36.4964	36.4964	36.4964	36.4964	36.4964	36.4964	36.4964	36.4964	36.4964	36.4964	36.4964 (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)												
	-107.9713	-107.9713	-107.9713	-107.9713	-107.9713	-107.9713	-107.9713	-107.9713	-107.9713	-107.9713	-107.9713	-107.9713 (71)
Water heating gains (Table 5)												
	116.6510	114.3357	110.0110	100.7159	94.9808	89.0032	85.4133	88.5038	92.1113	98.7431	107.6631	115.4770 (72)
Total internal gains	556.8561	570.7413	546.2778	527.3165	499.8009	481.5660	462.7249	463.2244	477.5953	493.8932	524.5939	544.6649 (73)

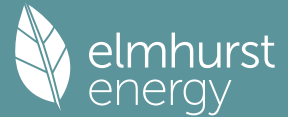
6. Solar gains

[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					9.9000	11.2829	0.4000	0.6000	0.7700			18.5781 (75)
Southwest					12.1900	36.7938	0.4000	0.6000	0.7700			74.5973 (79)
Solar gains	93.1754	164.8832	241.9914	327.3129	391.6946	399.8925	380.9487	331.2307	271.2730	186.6505	112.7265	79.0116 (83)
Total gains	650.0316	735.6244	788.2691	854.6294	891.4955	881.4585	843.6736	794.4551	748.8683	680.5437	637.3203	623.6765 (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)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	102.8034	103.1551	103.5092	105.3169	105.6860	107.5711	107.5711	107.9562	106.8090	105.6860	104.9503	104.2248
alpha	7.8536	7.8770	7.9006	8.0211	8.0457	8.1714	8.1714	8.1971	8.1206	8.0457	7.9967	7.9483
util living area	0.9980	0.9939	0.9817	0.9218	0.7667	0.5429	0.3911	0.4325	0.6845	0.9451	0.9935	0.9985 (86)
MIT	20.3314	20.4663	20.6397	20.8589	20.9731	20.9984	20.9999	20.9998	20.9912	20.8471	20.5590	20.3142 (87)
Th 2	20.2381	20.2405	20.2429	20.2550	20.2574	20.2695	20.2695	20.2719	20.2647	20.2574	20.2526	20.2477 (88)
util rest of house	0.9972	0.9917	0.9750	0.8969	0.7158	0.4818	0.3262	0.3642	0.6169	0.9216	0.9906	0.9979 (89)
MIT 2	19.6294	19.7652	19.9369	20.1502	20.2420	20.2689	20.2695	20.2719	20.2608	20.1458	19.8679	19.6205 (90)
Living area fraction	19.7098	19.8455	20.0174	20.2314	20.3257	20.3525	20.3532	20.3553	20.3445	20.2261	19.9471	19.6999 (91)
MIT	19.7098	19.8455	20.0174	20.2314	20.3257	20.3525	20.3532	20.3553	20.3445	20.2261	19.9471	19.6999 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7098	19.8455	20.0174	20.2314	20.3257	20.3525	20.3532	20.3553	20.3445	20.2261	19.9471	19.6999 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9965	0.9902	0.9725	0.8960	0.7207	0.4888	0.3337	0.3720	0.6244	0.9205	0.9891	0.9973 (94)
Useful gains	647.7303	728.4104	766.5870	765.7556	642.4777	430.8593	281.5067	295.5764	467.5946	626.4143	630.3833	622.0222 (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	1209.5153	1169.0743	1053.7445	868.1722	658.5673	431.5030	281.5305	295.6326	471.7508	734.9470	987.7387	1199.9973 (97)
Space heating kWh	417.9680	296.1262	213.6452	73.7399	11.9707	0.0000	0.0000	0.0000	0.0000	80.7483	257.2959	430.0135 (98a)
Space heating requirement - total per year (kWh/year)												1781.5076
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	417.9680	296.1262	213.6452	73.7399	11.9707	0.0000	0.0000	0.0000	0.0000	80.7483	257.2959	430.0135 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1781.5076
Space heating per m2												18.5574 (99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)
Fraction of space heat from community system												1.0000 (302)
Fraction of heat from community Heat pump-Space												1.0000 (303a)
Fraction of heat from community Heat pump-Water												1.0000 (303b)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500 (305)
Distribution loss factor (Table 12c) for community heating system												1.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	417.9680	296.1262	213.6452	73.7399	11.9707	0.0000	0.0000	0.0000	0.0000	80.7483	257.2959	430.0135 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00												
307a	438.8664	310.9325	224.3274	77.4269	12.5692	0.0000	0.0000	0.0000	0.0000	84.7858	270.1607	451.5142
Space heating requirement	438.8664	310.9325	224.3274	77.4269	12.5692	0.0000	0.0000	0.0000	0.0000	84.7858	270.1607	451.5142 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement	221.7724	195.6311	206.9146	180.1122	173.2833	154.7494	151.8750	158.7904	161.4799	181.7017	195.1559	219.1453 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00												
310b	221.7724	195.6311	206.9146	180.1122	173.2833	154.7494	151.8750	158.7904	161.4799	181.7017	195.1559	219.1453
Water heating fuel	221.7724	195.6311	206.9146	180.1122	173.2833	154.7494	151.8750	158.7904	161.4799	181.7017	195.1559	219.1453 (310)
Cooling System Energy Efficiency Ratio	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	17.4635	15.7735	17.4635	16.9002	17.4635	16.9002	17.4635	17.4635	16.9002	17.4635	16.9002	17.4635 (331)
Lighting	28.1883	22.6137	20.3611	14.9174	11.5227	9.4141	10.5114	13.6631	17.7470	23.2850	26.3003	28.9718 (332)
Electricity generated by PVs (Appendix M) (negative quantity)	-12.2003	-18.8524	-29.7361	-36.7984	-42.7244	-41.0324	-40.5111	-36.6695	-30.5128	-22.9150	-13.9793	-10.3615 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												1870.5829 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2200.6111 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution (space)												18.7058 (313)
Electricity used for heat distribution (water)												2.1915 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6625)												
mechanical ventilation fans (SFP = 0.6625)												205.6188 (330a)
Total electricity for the above, kWh/year												205.6188 (331)
Electricity for lighting (calculated in Appendix L)												227.4959 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-336.2933 (333)
Wind generation												0.0000 (334)
Hydro-electric generation (Appendix N)												0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (335)
Appendix Q - special features												
Energy saved or generated												-0.0000 (336)
Energy used												0.0000 (337)
Total delivered energy for all uses												4168.0155 (338)

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12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			330.0000 (367)
Space heating from Heat pump	566.8433	0.1573	89.1696 (367)
Efficiency of heat source Heat pump			440.0000 (367)
Water heating from Heat pump	500.1389	0.0000	0.0000 (368)
Electrical energy for heat distribution (space & water)	18.7058	0.0000	6.0481 (372)
Overall CO2 factor for heat network (space)			0.0492 (386)
Overall CO2 factor for heat network (water)			0.0335 (386)
Total CO2 associated with community systems			165.7975 (373)
Space and water heating			165.7975 (376)
Pumps, fans and electric keep-hot	205.6188	0.1387	28.5219 (378)
Energy for lighting	227.4959	0.1443	32.8347 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-336.2933	0.1327	-44.6229
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-44.6229 (380)
Total CO2, kg/year			182.5312 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.9000 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			330.0000 (467a)
Space heating from Heat pump	566.8433	1.5824	896.9500 (467)
Efficiency of heat source Heat pump			440.0000 (467b)
Water heating from Heat pump	500.1389	0.0000	0.0000 (468)
Electrical energy for heat distribution (space & water)	18.7058	0.0000	63.0887 (472)
Overall CO2 factor for heat network (space)			0.4953 (486)
Overall CO2 factor for heat network (water)			0.3611 (486)
Total CO2 associated with community systems			1721.1615 (473)
Space and water heating			1721.1615 (476)
Pumps, fans and electric keep-hot	205.6188	1.5128	311.0601 (478)
Energy for lighting	227.4959	1.5338	348.9408 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-336.2933	1.4903	-501.1749
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-501.1749 (480)
Total Primary energy kWh/year			1879.9874 (483)
Dwelling Primary energy Rate (DPER)			19.5800 (484)

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

1. Overall dwelling characteristics

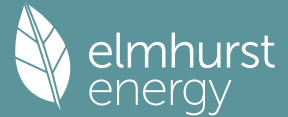
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	48.0000 (1b)	x 2.5000 (2b)	= 120.0000 (1b) - (3b)
First floor	48.0000 (1c)	x 2.8000 (2c)	= 134.4000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	96.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 254.4000 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	(6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 30.0000 / (5) = 0.1179 (8)
Pressure Test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3679 (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) = 0.3127 (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	0.3987	0.3909	0.3831	0.3440	0.3362	0.2971	0.2971	0.2893	0.3127	0.3362	0.3518	0.3675 (22b)
Effective ac	0.5795	0.5764	0.5734	0.5592	0.5565	0.5441	0.5441	0.5418	0.5489	0.5565	0.5619	0.5675 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.2100	1.0000	2.2100			(26)
TER Opening Type			21.8000	1.1450	24.9618			(27)
Heat Loss Floor 1			48.0000	0.1300	6.2400			(28a)
External Wall 1	74.2000	24.0100	50.1900	0.1800	9.0342			(29a)
External Roof 1	48.0000		48.0000	0.1100	5.2800			(30)
Total net area of external elements Aum(A, m2)			170.2000					(31)
Fabric heat loss, W/K = Sum (A x U)					47.7260			(33)
Main dwelling								
Party Wall hall			74.2000	0.0000	0.0000			(32)

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

302.5885 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
P1 Party wall - Ground floor	14.0000	0.0800	1.1200	
P2 Party wall - Intermediate floor within a dwelling	14.0000	0.0000	0.0000	
E1 Steel lintel with perforated steel base plate	11.3500	0.0500	0.5675	
E3 Sill	10.3500	0.0500	0.5175	
E4 Jamb	33.4700	0.0500	1.6735	
E18 Party wall between dwellings	21.2000	0.0600	1.2720	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				5.1505 (36)
Point Thermal bridges				(36a) = 0.0000
Total fabric heat loss				(33) + (36) + (36a) = 52.8765 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	48.6499	48.3907	48.1367	46.9435	46.7203	45.6811	45.6811	45.4887	46.0814	46.7203	47.1719	47.6440	(38)
Average = Sum(39)m / 12 =	101.5264	101.2672	101.0132	99.8201	99.5968	98.5577	98.5577	98.3652	98.9579	99.5968	100.0484	100.5206	(39)
												99.8190	
HLP	1.0576	1.0549	1.0522	1.0398	1.0375	1.0266	1.0266	1.0246	1.0308	1.0375	1.0422	1.0471	(40)
HLP (average)												1.0398	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

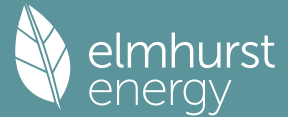
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6993 (42)
Hot water usage for mixer showers													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
80.1319	78.9418	77.2660	74.1760	71.8622	69.2966	67.9108	69.5750	71.3869	74.1322	77.2858	79.8610	79.8610	(42b)
Hot water usage for other uses													
42.2734	40.7361	39.1989	37.6617	36.1245	34.5873	34.5873	36.1245	37.6617	39.1989	40.7361	42.2734	42.2734	(42c)
Average daily hot water use (litres/day)													112.7252 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	122.4053	119.6780	116.4649	111.8377	107.9867	103.8839	102.4981	105.6995	109.0486	113.3311	118.0220	122.1344	(44)
Energy conte	193.8600	170.4199	179.0022	153.1002	145.3709	127.7374	123.9626	130.8780	134.4679	153.7893	168.1439	191.2329	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
29.0790	25.5630	26.8503	22.9650	21.8056	19.1606	18.5944	19.6317	20.1702	23.0684	25.2216	28.6849	28.6849	(46)
Water storage loss (or HIU loss):													
Store volume													15.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													0.4337 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.2342 (55)
Total storage loss													
7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	(56)
If cylinder contains dedicated solar storage													
7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
224.3819	197.9880	209.5241	182.6375	175.8928	157.2747	154.4845	161.3999	164.0052	184.3112	197.6813	221.7548	221.7548	(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													
224.3819	197.9880	209.5241	182.6375	175.8928	157.2747	154.4845	161.3999	164.0052	184.3112	197.6813	221.7548	221.7548	(64)
Total per year (kWh/year)													2231.3362 (64)
Electric shower(s)													2231 (64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month													
88.8760	78.7192	83.9358	74.5357	72.7534	66.1026	65.6351	67.9345	68.3404	75.5525	79.5377	88.0025	88.0025	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	134.9642	134.9642	134.9642	134.9642	134.9642	134.9642	134.9642	134.9642	134.9642	134.9642	134.9642	134.9642	(66)
125.9165	139.4076	125.9165	130.1138	125.9165	130.1138	125.9165	125.9165	130.1138	125.9165	130.1138	125.9165	125.9165	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	249.6943	252.2854	245.7560	231.8558	214.3093	197.8180	186.8008	184.2098	190.7391	204.6393	222.1859	238.6771	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.4964	36.4964	36.4964	36.4964	36.4964	36.4964	36.4964	36.4964	36.4964	36.4964	36.4964	36.4964	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
-107.9713	-107.9713	-107.9713	-107.9713	-107.9713	-107.9713	-107.9713	-107.9713	-107.9713	-107.9713	-107.9713	-107.9713	-107.9713	(71)
Water heating gains (Table 5)													
119.4570	117.1416	112.8169	103.5218	97.7868	91.8091	88.2192	91.3098	94.9173	101.5490	110.4691	118.2829	118.2829	(72)
Total internal gains													
561.5571	575.3238	550.9787	531.9806	504.5018	483.2301	464.4258	464.9254	479.2594	498.5942	529.2580	549.3658	549.3658	(73)

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6. Solar gains

[Jan]	Area m2		Solar flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
Northeast	9.7700		11.2829		0.6300		0.7000		0.7700		33.6890 (75)	
Southwest	12.0300		36.7938		0.6300		0.7000		0.7700		135.2734 (79)	
Solar gains	168.9625	298.9957	438.8220	593.5421	710.2903	725.1562	690.8039	600.6465	491.9206	338.4681	204.4159	143.2780 (83)
Total gains	730.5196	874.3195	989.8007	1125.5227	1214.7921	1208.3863	1155.2297	1065.5718	971.1800	837.0622	733.6739	692.6439 (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	79.4771	79.6805	79.8809	80.8357	81.0169	81.8711	81.8711	82.0313	81.5400	81.0169	80.6512	80.2724
alpha	6.2985	6.3120	6.3254	6.3890	6.4011	6.4581	6.4581	6.4688	6.4360	6.4011	6.3767	6.3515
util living area	0.9972	0.9908	0.9712	0.8932	0.7256	0.5182	0.3750	0.4237	0.6797	0.9382	0.9919	0.9979 (86)
MIT	20.0606	20.2574	20.5105	20.8027	20.9563	20.9955	20.9995	20.9990	20.9779	20.7559	20.3544	20.0293 (87)
Th 2	20.0356	20.0379	20.0400	20.0503	20.0522	20.0612	20.0612	20.0629	20.0577	20.0522	20.0483	20.0443 (88)
util rest of house	0.9961	0.9874	0.9606	0.8598	0.6644	0.4441	0.2952	0.3379	0.5972	0.9100	0.9883	0.9971 (89)
MIT 2	18.9512	19.2027	19.5199	19.8687	20.0213	20.0592	20.0611	20.0626	20.0458	19.8276	19.3356	18.9180 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.0783	19.3236	19.6334	19.9757	20.1284	20.1665	20.1686	20.1699	20.1526	19.9339	19.4523	19.0453 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.0783	19.3236	19.6334	19.9757	20.1284	20.1665	20.1686	20.1699	20.1526	19.9339	19.4523	19.0453 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9945	0.9839	0.9549	0.8568	0.6696	0.4525	0.3044	0.3478	0.6059	0.9058	0.9851	0.9959 (94)
Useful gains	726.4701	860.2332	945.1711	964.3601	813.4083	546.7854	351.6006	370.5633	588.4299	758.1736	722.7165	689.8000 (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	1500.3902	1460.6342	1326.6456	1105.5752	839.4467	548.6175	351.7136	370.8252	598.9503	929.6303	1235.8307	1492.2627 (97)
Space heating kWh	575.7966	403.4695	283.8170	101.6749	19.3725	0.0000	0.0000	0.0000	0.0000	127.5638	369.4422	597.0323 (98a)
Space heating requirement - total per year (kWh/year)	2478.1688											
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	575.7966	403.4695	283.8170	101.6749	19.3725	0.0000	0.0000	0.0000	0.0000	127.5638	369.4422	597.0323 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2478.1688											
Space heating per m2	(98c) / (4) = 25.8143 (99)											

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)											
Fraction of space heat from main system(s)	1.0000 (202)											
Fraction of main heating from main system 2	0.0000 (203)											
Fraction of total heating from main system 1	1.0000 (204)											
Fraction of total heating from main system 2	0.0000 (205)											
Efficiency of main space heating system 1 (in %)	92.3000 (206)											
Efficiency of main space heating system 2 (in %)	88.8000 (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	575.7966	403.4695	283.8170	101.6749	19.3725	0.0000	0.0000	0.0000	0.0000	127.5638	369.4422	597.0323 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	623.8316	437.1284	307.4941	110.1570	20.9887	0.0000	0.0000	0.0000	0.0000	138.2056	400.2624	646.8389 (211)
Space heating efficiency (main heating system 2)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Space heating fuel used, main system 2	0.0000 (213)											
Water heating												
Water heating requirement	224.3819	197.9880	209.5241	182.6375	175.8928	157.2747	154.4845	161.3999	164.0052	184.3112	197.6813	221.7548 (64)
Efficiency of water heater	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000 (216)
(217)m	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000 (217)
Fuel for water heating, kWh/month	281.1804	248.1053	262.5616	228.8691	220.4170	197.0861	193.5896	202.2556	205.5203	230.9664	247.7209	277.8883 (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	11.1260	10.0493	11.1260	10.7671	11.1260	10.7671	11.1260	10.7671	11.1260	10.7671	11.1260	11.1260 (231)
Lighting	26.1630	20.9889	18.8982	13.8456	10.6948	8.7377	9.7561	12.6814	16.4718	21.6119	24.4106	26.8901 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-44.1859	-61.9305	-88.5196	-98.9669	-106.2634	-99.0329	-97.8015	-92.5371	-83.1947	-70.5381	-48.4445	-38.2436 (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)

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Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-26.0956	-54.7597	-108.5872	-162.7305	-214.8251	-215.7191	-213.1851	-180.6684	-132.6413	-78.1983	-34.8046	-20.6467 (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												2684.9066 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.8000
Water heating fuel used												2796.1606 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												131.0000 (231)
Electricity for lighting (calculated in Appendix L)												211.1502 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2372.5203 (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												3450.6971 (238)

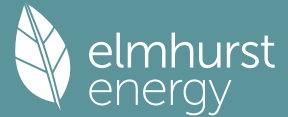
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2684.9066	0.2100	563.8304 (261)
Space heating - main system 2	0.0000	0.2100	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2796.1606	0.2100	587.1937 (264)
Space and water heating			1151.0241 (265)
Pumps, fans and electric keep-hot	131.0000	0.1387	18.1713 (267)
Energy for lighting	211.1502	0.1443	30.4755 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-929.6587	0.1347	-125.2295
PV Unit electricity exported	-1442.8616	0.1260	-181.7447
Total			-306.9743 (269)
Total CO2, kg/year			892.6966 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.3000 (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	2684.9066	1.1300	3033.9445 (275)
Space heating - main system 2	0.0000	1.1300	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2796.1606	1.1300	3159.6615 (278)
Space and water heating			6193.6060 (279)
Pumps, fans and electric keep-hot	131.0000	1.5128	198.1768 (281)
Energy for lighting	211.1502	1.5338	323.8692 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-929.6587	1.4979	-1392.4919
PV Unit electricity exported	-1442.8616	0.4624	-667.1326
Total			-2059.6245 (283)
Total Primary energy kWh/year			4656.0274 (286)
Target Primary Energy Rate (TPER)			48.5000 (287)

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Plot Reference	00grd sample 3 Plot 03				Issued on Date	13/12/2025	
Assessment Reference	Block E 4B7P D			Plot Type Ref	Block E 4B7P D		
Plot Address					SAP Version	10.2	
SAP Rating	88 B	DER	1.55	TER	7.93		
Environmental	99 A	% DER < TER				80.45	
CO ₂ Emissions (t/year)	0.15	DFEE	32.18	TFEE	29.73		
Compliance Check	See BREL	% DFEE < TFEE				-8.22	
% DPER < TPER	61.09	DPER	16.05	TPER	41.24		
Assessor Details	Mr. Andrew Jones				Assessor ID	N955-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	60.0000 (1b)	x 2.5000 (2b)	= 150.0000 (1b) - (3b)
First floor	60.0000 (1c)	x 2.8000 (2c)	= 168.0000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	318.0000 (5)

2. Ventilation rate

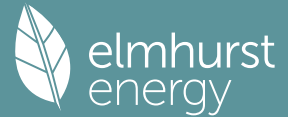
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												85.5000 (23c)
Effective ac	0.2351	0.2319	0.2287	0.2128	0.2096	0.1936	0.1936	0.1904	0.2000	0.2096	0.2159	0.2223 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows Open			23.9200	1.1450	27.3893		(27)
External Door			2.2100	1.2000	2.6520		(26)
External Wall 1		26.1300	56.0200	0.1500	8.4030	70.0000	3921.3999 (29a)
External Roof 1	48.0000		48.0000	0.1100	5.2800	9.0000	432.0000 (30)
Total net area of external elements Aum(A, m ²)			130.1500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		43.7243		(33)
Main dwelling							
Party Wall hall			82.1500	0.0000	0.0000	180.0000	14787.0003 (32)
Party Floor 1			60.0000			40.0000	2400.0000 (32d)
Internal Wall 1			285.1200			9.0000	2566.0800 (32c)
Internal Floor 1			60.0000			40.0000	2400.0000 (32d)
Internal Ceiling 1			60.0000			30.0000	1800.0000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	28306.4802 (34)

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Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 235.8873 (35)
Thermal bridges (User defined value 0.075 * total exposed area) 9.7612 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 53.4856 (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	24.6675	24.3330	23.9985	22.3260	21.9915	20.3190	20.3190	19.9845	20.9880	21.9915	22.6605	23.3295
Heat transfer coeff	83.3162	82.0788	80.3363	77.1235	74.7178	72.0503	70.6094	72.3397	74.2237	77.0780	80.3570	83.0345
Average = Sum(39)m / 12 =	78.1530	77.8185	77.4840	75.8115	75.4771	73.8046	73.8046	73.4701	74.4736	75.4771	76.1460	76.8150
												75.7279
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.6513	0.6485	0.6457	0.6318	0.6290	0.6150	0.6150	0.6123	0.6206	0.6290	0.6346	0.6401
HLP (average)												0.6311
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												
Hot water usage for mixer showers												2.8633
	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												
	83.3162	82.0788	80.3363	77.1235	74.7178	72.0503	70.6094	72.3397	74.2237	77.0780	80.3570	83.0345
Hot water usage for other uses												
	43.9532	42.3549	40.7566	39.1583	37.5600	35.9617	35.9617	37.5600	39.1583	40.7566	42.3549	43.9532
Average daily hot water use (litres/day)												117.2047
												(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	127.2694	124.4337	121.0929	116.2819	112.2779	108.0120	106.5711	109.8997	113.3820	117.8346	122.7119	126.9877
Energy conte	201.5636	177.1919	186.1153	159.1840	151.1476	132.8134	128.8886	136.0788	139.8113	159.9005	174.8256	198.8321
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m												1946.3526
	30.2345	26.5788	27.9173	23.8776	22.6721	19.9220	19.3333	20.4118	20.9717	23.9851	26.2238	29.8248
Water storage loss (or HIU loss):												
Store volume												15.0000
a) If manufacturer declared loss factor is known (kWh/day):												0.2500
Temperature factor from Table 2b												0.6000
Enter (49) or (54) in (55)												0.1500
Total storage loss												(47)
	4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500
If cylinder contains dedicated solar storage												(56)
	4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624
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
Total heat required for water heating calculated for each month												
	229.4760	202.4031	214.0277	186.1960	179.0600	159.8254	156.8010	163.9912	166.8233	187.8129	201.8376	226.7445
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
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
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Output from w/h												
	229.4760	202.4031	214.0277	186.1960	179.0600	159.8254	156.8010	163.9912	166.8233	187.8129	201.8376	226.7445
12Total per year (kWh/year)												2274.9986
Electric shower(s)												2275
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000
Heat gains from water heating, kWh/month												
	89.3498	79.0853	84.2133	74.5383	72.5865	65.7700	65.1854	67.5761	68.0969	75.4968	79.7391	88.4416

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	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	148.2354	164.1178	148.2354	153.1766	148.2354	153.1766	148.2354	148.2354	153.1766	148.2354	153.1766	148.2354
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	285.2132	288.1728	280.7146	264.8371	244.7946	225.9575	213.3731	210.4135	217.8717	233.7492	253.7917	272.6288
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166
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
Losses e.g. evaporation (negative values) (Table 5)												
	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326
Water heating gains (Table 5)												
	120.0938	117.6864	113.1899	103.5254	97.5625	91.3473	87.6147	90.8281	94.5790	101.4742	110.7488	118.8731
Total internal gains												
	619.4921	635.9267	608.0897	587.4889	556.5422	536.4311	515.1730	515.4268	531.5769	549.4085	583.6667	605.6870

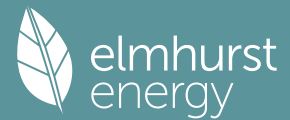
6. Solar gains

[Jan]		Area	Solar flux	g	FF	Access	Gains
		m2	Table 6a	Specific data	Specific data	factor	W
			W/m2	or Table 6b	or Table 6c	Table 6d	
Southwest		10.2800	36.7938	0.4000	0.6000	0.7700	62.9090
Northwest		13.6400	11.2829	0.4000	0.6000	0.7700	25.5965
Solar gains	88.5055	159.2597	240.4893	335.8308	410.7089	422.9364	401.4313
Total gains	707.9976	795.1865	848.5790	923.3197	967.2511	959.3675	916.6043
							343.2455
							273.1401
							182.1050
							107.5575
							74.7404
							680.4274

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)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	100.6092	101.0416	101.4778	103.7165	104.1762	106.5369	106.5369	107.0220	105.5799	104.1762	103.2609	102.3616
alpha	7.7073	7.7361	7.7652	7.9144	7.9451	8.1025	8.1025	8.1348	8.0387	7.9451	7.8841	7.8241
util living area	0.9959	0.9889	0.9697	0.8849	0.7092	0.4916	0.3542	0.3935	0.6322	0.9169	0.9877	0.9968 (86)
MIT	20.3800	20.5177	20.6890	20.8960	20.9834	20.9992	21.0000	20.9999	20.9947	20.8814	20.6104	20.3659 (87)
Th 2	20.3841	20.3866	20.3890	20.4015	20.4040	20.4165	20.4165	20.4190	20.4115	20.4040	20.3990	20.3940 (88)
util rest of house	0.9947	0.9860	0.9618	0.8608	0.6688	0.4471	0.3073	0.3438	0.5809	0.8932	0.9838	0.9959 (89)
MIT 2	19.8129	19.9512	20.1201	20.3214	20.3935	20.4161	20.4165	20.4190	20.4088	20.3141	20.0541	19.8075 (90)
Living area fraction	19.9010	20.0391	20.2084	20.4106	20.4851	20.5066	20.5071	20.5091	FLA = Living area / (4) =	20.4022	20.1405	0.1552 (91)
MIT	19.9010	20.0391	20.2084	20.4106	20.4851	20.5066	20.5071	20.5091	20.4997	20.4022	20.1405	19.8942 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9010	20.0391	20.2084	20.4106	20.4851	20.5066	20.5071	20.5091	20.4997	20.4022	20.1405	19.8942 (93)

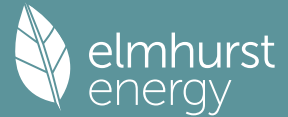
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9936	0.9839	0.9591	0.8612	0.6744	0.4540	0.3146	0.3515	0.5887	0.8932	0.9818	0.9950 (94)
Useful gains	703.4582	782.4233	813.8802	795.1566	652.3245	435.5381	288.3417	301.8594	473.7013	653.3642	678.6424	677.0302 (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	1219.2618	1178.1058	1062.1826	872.6394	663.0749	435.9371	288.3586	301.8991	476.6103	739.8413	992.9793	1205.5513 (97)
Space heating kWh	383.7578	265.8987	184.7370	55.7876	7.9983	0.0000	0.0000	0.0000	0.0000	64.3390	226.3225	393.2197 (98a)
Space heating requirement - total per year (kWh/year)												1582.0605
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	383.7578	265.8987	184.7370	55.7876	7.9983	0.0000	0.0000	0.0000	0.0000	64.3390	226.3225	393.2197 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1582.0605
Space heating per m2										(98c) / (4) =		13.1838 (99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)
Fraction of space heat from community system												1.0000 (302)
Fraction of heat from community Heat pump-Space												1.0000 (303a)
Fraction of heat from community Heat pump-Water												1.0000 (303b)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500 (305)
Distribution loss factor (Table 12c) for community heating system												1.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	383.7578	265.8987	184.7370	55.7876	7.9983	0.0000	0.0000	0.0000	0.0000	64.3390	226.3225	393.2197 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00												
307a	402.9457	279.1936	193.9738	58.5770	8.3982	0.0000	0.0000	0.0000	0.0000	67.5559	237.6387	412.8807
Space heating requirement	402.9457	279.1936	193.9738	58.5770	8.3982	0.0000	0.0000	0.0000	0.0000	67.5559	237.6387	412.8807 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement	229.4760	202.4031	214.0277	186.1960	179.0600	159.8254	156.8010	163.9912	166.8233	187.8129	201.8376	226.7445 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00												
310b	229.4760	202.4031	214.0277	186.1960	179.0600	159.8254	156.8010	163.9912	166.8233	187.8129	201.8376	226.7445
Water heating fuel	229.4760	202.4031	214.0277	186.1960	179.0600	159.8254	156.8010	163.9912	166.8233	187.8129	201.8376	226.7445 (310)
Cooling System Energy Efficiency Ratio	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	21.8294	19.7169	21.8294	21.1252	21.8294	21.1252	21.8294	21.8294	21.1252	21.8294	21.1252	21.8294 (331)
Lighting	32.8960	26.3904	23.7617	17.4088	13.4471	10.9864	12.2669	15.9449	20.7109	27.1738	30.6928	33.8103 (332)
Electricity generated by PVs (Appendix M) (negative quantity)	-12.3696	-19.2110	-30.4544	-37.8835	-44.1614	-42.4762	-41.9357	-37.8734	-31.3917	-23.4291	-14.2059	-10.4952 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												1661.1636 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2274.9986 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution (space)												16.6116 (313)
Electricity used for heat distribution (water)												2.2674 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6625)												
mechanical ventilation fans (SFP = 0.6625)												257.0235 (330a)
Total electricity for the above, kWh/year												257.0235 (331)
Electricity for lighting (calculated in Appendix L)												265.4900 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-345.8872 (333)
Wind generation												0.0000 (334)
Hydro-electric generation (Appendix N)												0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (335)
Appendix Q - special features												
Energy saved or generated												-0.0000 (336)
Energy used												0.0000 (337)
Total delivered energy for all uses												4112.7884 (338)

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12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			330.0000 (367)
Space heating from Heat pump	503.3829	0.1577	79.3590 (367)
Efficiency of heat source Heat pump			440.0000 (367)
Water heating from Heat pump	517.0451	0.0000	0.0000 (368)
Electrical energy for heat distribution (space & water)	16.6116	0.0000	5.8296 (372)
Overall CO2 factor for heat network (space)			0.0493 (386)
Overall CO2 factor for heat network (water)			0.0335 (386)
Total CO2 associated with community systems			158.1614 (373)
Space and water heating			158.1614 (376)
Pumps, fans and electric keep-hot	257.0235	0.1387	35.6523 (378)
Energy for lighting	265.4900	0.1443	38.3184 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-345.8872	0.1326	-45.8620
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-45.8620 (380)
Total CO2, kg/year			186.2702 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.5500 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			330.0000 (467a)
Space heating from Heat pump	503.3829	1.5836	797.1643 (467)
Efficiency of heat source Heat pump			440.0000 (467b)
Water heating from Heat pump	517.0451	0.0000	0.0000 (468)
Electrical energy for heat distribution (space & water)	16.6116	0.0000	60.9290 (472)
Overall CO2 factor for heat network (space)			0.4957 (486)
Overall CO2 factor for heat network (water)			0.3611 (486)
Total CO2 associated with community systems			1644.9711 (473)
Space and water heating			1644.9711 (476)
Pumps, fans and electric keep-hot	257.0235	1.5128	388.8251 (478)
Energy for lighting	265.4900	1.5338	407.2174 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-345.8872	1.4899	-515.3454
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-515.3454 (480)
Total Primary energy kWh/year			1925.6682 (483)
Dwelling Primary energy Rate (DPER)			16.0500 (484)

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

1. Overall dwelling characteristics

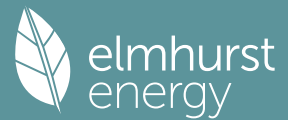
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	60.0000 (1b)	x 2.5000 (2b)	= 150.0000 (1b) - (3b)
First floor	60.0000 (1c)	x 2.8000 (2c)	= 168.0000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	318.0000 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1258 (8)
Pressure Test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3758 (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) = 0.3194 (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	0.4073	0.3993	0.3913	0.3514	0.3434	0.3034	0.3034	0.2955	0.3194	0.3434	0.3593	0.3753 (22b)
Effective ac	0.5829	0.5797	0.5766	0.5617	0.5590	0.5460	0.5460	0.5436	0.5510	0.5590	0.5646	0.5704 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.2100	1.0000	2.2100			(26)
TER Opening Type			23.9200	1.1450	27.3893			(27)
External Wall 1	82.1500	26.1300	56.0200	0.1800	10.0836			(29a)
External Roof 1	48.0000		48.0000	0.1100	5.2800			(30)
Total net area of external elements Aum(A, m2)			130.1500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)... (30) + (32) =	44.9629			(33)
Main dwelling								
Party Wall hall			82.1500	0.0000	0.0000			(32)

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

235.8873 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
P1 Party wall - Ground floor	15.5000	0.0800	1.2400	
P2 Party wall - Intermediate floor within a dwelling	15.5000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	15.5000	0.1200	1.8600	
E7 Party floor between dwellings (in blocks of flats)	15.5000	0.0700	1.0850	
E1 Steel lintel with perforated steel base plate	11.9500	0.0500	0.5975	
E3 Sill	10.9500	0.0500	0.5475	
E4 Jamb	39.8000	0.0500	1.9900	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			7.3200	(36)
Point Thermal Bridges			0.0000	(36a) =
Total fabric heat loss		(33) + (36) + (36a) =	52.2829	(37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	61.1726	60.8347	60.5035	58.9476	58.6565	57.3015	57.3015	57.0505	57.8234	58.6565	59.2454	59.8611	(38)
Average = Sum(39)m / 12 =	113.4555	113.1176	112.7864	111.2305	110.9394	109.5844	109.5844	109.3334	110.1063	110.9394	111.5283	112.1440	(39)
												111.2291	
HLP	0.9455	0.9426	0.9399	0.9269	0.9245	0.9132	0.9132	0.9111	0.9176	0.9245	0.9294	0.9345	(40)
HLP (average)												0.9269	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

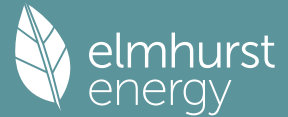
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8633 (42)
Hot water usage for mixer showers													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
83.3162	82.0788	80.3363	77.1235	74.7178	72.0503	70.6094	72.3397	74.2237	77.0780	80.3570	83.0345	83.0345	(42b)
Hot water usage for other uses													
43.9532	42.3549	40.7566	39.1583	37.5600	35.9617	35.9617	37.5600	39.1583	40.7566	42.3549	43.9532	43.9532	(42c)
Average daily hot water use (litres/day)													117.2047 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.2694	124.4337	121.0929	116.2819	112.2779	108.0120	106.5711	109.8997	113.3820	117.8346	122.7119	126.9877	(44)
Energy conte	201.5636	177.1919	186.1153	159.1840	151.1476	132.8134	128.8886	136.0788	139.8113	159.9005	174.8256	198.8321	(45)
Energy content (annual)													Total = Sum(45)m = 1946.3526
Distribution loss (46)m = 0.15 x (45)m													
30.2345	26.5788	27.9173	23.8776	22.6721	19.9220	19.3333	20.4118	20.9717	23.9851	26.2238	29.8248	29.8248	(46)
Water storage loss (or HIU loss):													
Store volume													15.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													0.4337 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.2342 (55)
Total storage loss													
7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	(56)
If cylinder contains dedicated solar storage													
7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
232.0855	204.7601	216.6373	188.7214	181.6695	162.3507	159.4105	166.6007	169.3487	190.4224	204.3629	229.3540	229.3540	(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													
232.0855	204.7601	216.6373	188.7214	181.6695	162.3507	159.4105	166.6007	169.3487	190.4224	204.3629	229.3540	229.3540	(64)
Total per year (kWh/year)													2305.7237 (64)
Electric shower(s)													2306 (64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month													
91.4374	80.9709	86.3009	76.5586	74.6741	67.7903	67.2730	69.6637	70.1171	77.5845	81.7594	90.5292	90.5292	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
144.9216	160.4489	144.9216	149.7523	144.9216	149.7523	144.9216	144.9216	149.7523	144.9216	149.7523	144.9216	144.9216	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
285.2132	288.1728	280.7146	264.8371	244.7946	225.9575	213.3731	210.4135	217.8717	233.7492	253.7917	272.6288	272.6288	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	(71)
Water heating gains (Table 5)													
122.8998	120.4924	115.9958	106.3314	100.3684	94.1532	90.4207	93.6341	97.3849	104.2802	113.5547	121.6790	121.6790	(72)
Total internal gains													
621.9843	638.0638	610.5818	589.8705	559.0344	535.8128	514.6652	514.9189	530.9586	551.9007	586.0484	608.1792	608.1792	(73)

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6. Solar gains

[Jan]	Area m2				Solar flux Table 6a W/m2	Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d	Gains W	
Southwest	10.2800				36.7938	0.6300		0.7000		0.7700	115.5952 (79)	
Northwest	13.6400				11.2829	0.6300		0.7000		0.7700	47.0336 (81)	
Solar gains	162.6289	292.6398	441.8992	617.0892	754.6776	777.1456	737.6300	630.7136	501.8949	334.6179	197.6369	137.3355 (83)
Total gains	784.6132	930.7036	1052.4810	1206.9597	1313.7120	1312.9584	1252.2951	1145.6325	1032.8536	886.5186	783.6854	745.5147 (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	69.3039	69.5109	69.7151	70.6902	70.8757	71.7521	71.7521	71.9168	71.4120	70.8757	70.5015	70.1144
alpha	5.6203	5.6341	5.6477	5.7127	5.7250	5.7835	5.7835	5.7945	5.7608	5.7250	5.7001	5.6743
util living area	0.9959	0.9887	0.9688	0.8932	0.7327	0.5275	0.3841	0.4369	0.6977	0.9383	0.9898	0.9969 (86)
MIT	19.9167	20.1229	20.4002	20.7385	20.9324	20.9914	20.9988	20.9976	20.9617	20.6854	20.2439	19.8876 (87)
Th 2	20.1290	20.1314	20.1337	20.1447	20.1467	20.1563	20.1563	20.1581	20.1526	20.1467	20.1426	20.1382 (88)
util rest of house	0.9946	0.9854	0.9597	0.8658	0.6803	0.4608	0.3109	0.3580	0.6259	0.9156	0.9862	0.9959 (89)
MIT 2	18.8612	19.1248	19.4742	19.8868	20.0924	20.1514	20.1559	20.1572	20.1275	19.8366	19.2887	18.8308 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.0250	19.2798	19.6180	20.0190	20.2229	20.2818	20.2868	20.2877	20.2570	19.9684	19.4370	18.9949 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.0250	19.2798	19.6180	20.0190	20.2229	20.2818	20.2868	20.2877	20.2570	19.9684	19.4370	18.9949 (93)

8. Space heating requirement

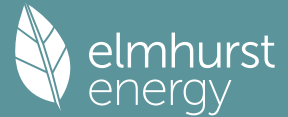
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9924	0.9811	0.9529	0.8612	0.6853	0.4709	0.3223	0.3703	0.6352	0.9099	0.9822	0.9941 (94)
Useful gains	778.6232	913.1320	1002.9491	1039.4444	900.2402	618.2369	403.6172	424.1967	656.0572	806.6718	769.7296	741.1090 (95)
Ext temp.	4.3000	4.9000	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	1670.6376	1626.6041	1479.5281	1236.7715	945.5210	622.6412	404.0116	425.0528	677.9277	1039.3210	1375.9246	1659.1570 (97)
Space heating kWh	663.6587	479.4533	354.5748	142.0755	33.6889	0.0000	0.0000	0.0000	0.0000	173.0910	436.4604	683.0277 (98a)
Space heating requirement - total per year (kWh/year)												2966.0303
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	663.6587	479.4533	354.5748	142.0755	33.6889	0.0000	0.0000	0.0000	0.0000	173.0910	436.4604	683.0277 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2966.0303
Space heating per m2												(98c) / (4) = 24.7169 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Fraction of main heating from main system 2												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												88.8000 (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	663.6587	479.4533	354.5748	142.0755	33.6889	0.0000	0.0000	0.0000	0.0000	173.0910	436.4604	683.0277 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	719.0235	519.4510	384.1547	153.9280	36.4994	0.0000	0.0000	0.0000	0.0000	187.5309	472.8715	740.0083 (211)
Space heating efficiency (main heating system 2)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Space heating fuel used, main system 2												0.0000 (213)
Water heating												
Water heating requirement	232.0855	204.7601	216.6373	188.7214	181.6695	162.3507	159.4105	166.6007	169.3487	190.4224	204.3629	229.3540 (64)
Efficiency of water heater	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000 (216)
(217)m	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000 (217)
Fuel for water heating, kWh/month	290.8340	256.5916	271.4753	236.4930	227.6560	203.4470	199.7625	208.7728	212.2164	238.6246	256.0939	287.4110 (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	11.1260	10.0493	11.1260	10.7671	11.1260	10.7671	11.1260	11.1260	10.7671	11.1260	10.7671	11.1260 (231)
Lighting	30.1119	24.1568	21.7506	15.9354	12.3090	10.0565	11.2286	14.5954	18.9580	24.8739	28.0950	30.9488 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-53.9111	-74.8947	-106.1001	-117.5100	-125.2131	-116.3092	-114.8192	-109.0827	-98.7958	-84.7398	-58.8519	-46.7364 (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)

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	3213.4673	1.1300	3631.2181 (275)
Space heating - main system 2	0.0000	1.1300	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2889.3781	1.1300	3264.9972 (278)
Space and water heating			6896.2153 (279)
Pumps, fans and electric keep-hot	131.0000	1.5128	198.1768 (281)
Energy for lighting	243.0199	1.5338	372.7520 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1106.9640	1.4986	-1658.9106
PV Unit electricity exported	-1858.6863	0.4627	-859.9767
Total			-2518.8874 (283)
Total Primary energy kWh/year			4948.2567 (286)
Target Primary Energy Rate (TPER)			41.2400 (287)

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Plot Reference	00grd sample 4 Plot 04				Issued on Date	13/12/2025	
Assessment Reference	Block E 1B2P			Plot Type Ref	Block E 1B2P		
Plot Address					SAP Version	10.2	
SAP Rating	86 B		DER	1.44		TER	15.06
Environmental	99 A		% DER < TER				90.44
CO ₂ Emissions (t/year)	0.06		DFEE	27.61		TFEE	31.97
Compliance Check	See BREL		% DFEE < TFEE				13.64
% DPER < TPER	82.00		DPER	14.88		TPER	82.69
Assessor Details	Mr. Andrew Jones				Assessor ID	N955-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	50.0000 (1b)	2.5000 (2b)	125.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	125.0000 (5)

2. Ventilation rate

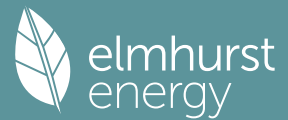
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												86.4000 (23c)
Effective ac	0.2306	0.2274	0.2242	0.2082	0.2051	0.1891	0.1891	0.1859	0.1955	0.2051	0.2114	0.2178 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows Open			8.6400	1.1450	9.8931		(27)
Heatloss Floor 1			50.0000	0.1100	5.5000	110.0000	5500.0000 (28a)
External Wall 1	17.5000	8.6400	8.8600	0.1500	1.3290	70.0000	620.2000 (29a)
Total net area of external elements A _{um} (A, m ²)			67.5000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.7221		(33)
Main dwelling							
Party Wall hall			55.0000	0.0000	0.0000	180.0000	9900.0000 (32)
Party Ceiling 1			50.0000			30.0000	1500.0000 (32b)
Internal Wall 1			89.3500			9.0000	804.1500 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	18324.3500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							366.4870 (35)
Thermal bridges (User defined value 0.075 * total exposed area)							5.0625 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	21.7846 (37)

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Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)\text{m} \times (5)$

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	9.5107	9.3792	9.2477	8.5903	8.4588	7.8014	7.8014	7.6699	8.0644	8.4588	8.7218	8.9848	(38)
Heat transfer coeff	31.2953	31.1638	31.0324	30.3749	30.2435	29.5860	29.5860	29.4546	29.8490	30.2435	30.5064	30.7694	(39)
Average = Sum(39)m / 12 =												30.3421	
HLP	0.6259	0.6233	0.6206	0.6075	0.6049	0.5917	0.5917	0.5891	0.5970	0.6049	0.6101	0.6154	(40)
HLP (average)												0.6068	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6901 (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	60.5412	59.6421	58.3759	56.0413	54.2933	52.3549	51.3079	52.5652	53.9342	56.0083	58.3909	60.3365	(42b)
Hot water usage for other uses	31.9383	30.7769	29.6155	28.4541	27.2927	26.1314	26.1314	27.2927	28.4541	29.6155	30.7769	31.9383	(42c)
Average daily hot water use (litres/day)												85.1660	(43)
Daily hot water use	92.4795	90.4190	87.9914	84.4955	81.5860	78.4863	77.4393	79.8580	82.3883	85.6238	89.1678	92.2748	(44)
Energy conte	146.4649	128.7554	135.2396	115.6701	109.8304	96.5080	93.6561	98.8808	101.5930	116.1907	127.0359	144.4801	(45)
Energy content (annual)										Total = Sum(45)m =		1414.3051	
Distribution loss (46)m = $0.15 \times (45)\text{m}$	21.9697	19.3133	20.2859	17.3505	16.4746	14.4762	14.0484	14.8321	15.2390	17.4286	19.0554	21.6720	(46)
Water storage loss (or HIU loss):													
Store volume												15.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2500	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.1500	(55)
Total storage loss	4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500	(56)
If cylinder contains dedicated solar storage	4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	174.3773	153.9666	163.1520	142.6821	137.7428	123.5200	121.5685	126.7932	128.6050	144.1031	154.0479	172.3925	(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	174.3773	153.9666	163.1520	142.6821	137.7428	123.5200	121.5685	126.7932	128.6050	144.1031	154.0479	172.3925	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1742.9511	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000	(64a)
Heat gains from water heating, kWh/month	71.0295	62.9801	67.2971	60.0699	58.8485	53.6985	53.4706	55.2078	55.3893	60.9633	63.8490	70.3695	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	78.7121	87.1455	78.7121	81.3358	78.7121	81.3358	78.7121	78.7121	81.3358	78.7121	81.3358	78.7121	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.2339	148.7618	144.9117	136.7153	126.3689	116.6447	110.1484	108.6205	112.4706	120.6670	131.0134	140.7376	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	(71)
Water heating gains (Table 5)	95.4698	93.7204	90.4531	83.4304	79.0975	74.5813	71.8690	74.2040	76.9296	81.9400	88.6792	94.5827	(72)
Total internal gains	369.7673	377.9792	362.4283	349.8331	332.5300	320.9133	309.0810	309.8882	319.0875	329.6705	349.3800	362.3839	(73)

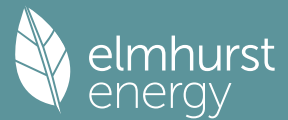
6. Solar gains

[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
-----					-----	-----		-----	-----	-----		-----
Northwest					8.6400	11.2829		0.4000	0.6000	0.7700		16.2136 (81)
-----					-----	-----		-----	-----	-----		-----
Solar gains	16.2136	33.0033	59.4615	97.6529	131.2646	139.9420	130.9129	104.3653	72.4548	40.3327	20.4010	13.2409 (83)
Total gains	385.9809	410.9826	421.8898	447.4860	463.7946	460.8553	439.9939	414.2534	391.5423	370.0032	369.7809	375.6248 (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	162.6472	163.3334	164.0254	167.5755	168.3041	172.0439	172.0439	172.8119	170.5282	168.3041	166.8533	165.4273	
alpha	11.8431	11.8889	11.9350	12.1717	12.2203	12.4696	12.4696	12.5208	12.3685	12.2203	12.1236	12.0285	
util living area	0.9926	0.9817	0.9489	0.8069	0.6059	0.4109	0.2959	0.3271	0.5259	0.8303	0.9708	0.9940	(86)

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MIT	20.7650	20.8344	20.9163	20.9891	20.9996	21.0000	21.0000	21.0000	20.9999	20.9876	20.8902	20.7579 (87)
Th 2	20.4067	20.4091	20.4115	20.4233	20.4256	20.4375	20.4375	20.4398	20.4327	20.4256	20.4209	20.4162 (88)
util rest of house	0.9897	0.9751	0.9329	0.7733	0.5687	0.3748	0.2580	0.2872	0.4827	0.7916	0.9596	0.9917 (89)
MIT 2	20.2012	20.2700	20.3472	20.4165	20.4254	20.4375	20.4375	20.4398	20.4327	20.4184	20.3339	20.2028 (90)
Living area fraction									fLA = Living area / (4) =			0.4640 (91)
MIT	20.4628	20.5319	20.6112	20.6822	20.6918	20.6985	20.6985	20.6997	20.6959	20.6825	20.5920	20.4604 (92)
Temperature adjustment												0.0000
adjusted MIT	20.4628	20.5319	20.6112	20.6822	20.6918	20.6985	20.6985	20.6997	20.6959	20.6825	20.5920	20.4604 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9901	0.9767	0.9387	0.7886	0.5860	0.3915	0.2756	0.3057	0.5028	0.8093	0.9633	0.9919	(94)
Useful gains	382.1429	401.3989	396.0255	352.8981	271.7789	180.4288	121.2577	126.6471	196.8612	299.4620	356.2013	372.5743	(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	505.8206	487.1500	437.9051	357.8832	271.9442	180.4297	121.2577	126.6471	196.8810	304.9307	411.5935	500.3219	(97)
Space heating kWh	92.0162	57.6248	31.1584	3.5893	0.1230	0.0000	0.0000	0.0000	0.0000	4.0687	39.8824	95.0442	(98a)
Space heating requirement - total per year (kWh/year)												323.5071	
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	92.0162	57.6248	31.1584	3.5893	0.1230	0.0000	0.0000	0.0000	0.0000	4.0687	39.8824	95.0442	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												323.5071	
Space heating per m2										(98c) / (4) =		6.4701	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)
Fraction of space heat from community system												1.0000 (302)
Fraction of heat from community Heat pump-Space												1.0000 (303a)
Fraction of heat from community Heat pump-Water												1.0000 (303b)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500 (305)
Distribution loss factor (Table 12c) for community heating system												1.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	92.0162	57.6248	31.1584	3.5893	0.1230	0.0000	0.0000	0.0000	0.0000	4.0687	39.8824	95.0442 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00												
307a	96.6171	60.5060	32.7164	3.7688	0.1291	0.0000	0.0000	0.0000	0.0000	4.2721	41.8765	99.7964
Space heating requirement	96.6171	60.5060	32.7164	3.7688	0.1291	0.0000	0.0000	0.0000	0.0000	4.2721	41.8765	99.7964 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement	174.3773	153.9666	163.1520	142.6821	137.7428	123.5200	121.5685	126.7932	128.6050	144.1031	154.0479	172.3925 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00												
310b	174.3773	153.9666	163.1520	142.6821	137.7428	123.5200	121.5685	126.7932	128.6050	144.1031	154.0479	172.3925
Water heating fuel	174.3773	153.9666	163.1520	142.6821	137.7428	123.5200	121.5685	126.7932	128.6050	144.1031	154.0479	172.3925 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	9.7140	8.7740	9.7140	9.4007	9.7140	9.4007	9.7140	9.7140	9.4007	9.7140	9.4007	9.7140 (331)
Lighting	17.4676	14.0132	12.6173	9.2440	7.1403	5.8337	6.5136	8.4667	10.9974	14.4291	16.2977	17.9531 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-11.4789	-17.3419	-26.7472	-32.3445	-36.8965	-35.2163	-34.7920	-31.8223	-26.9422	-20.7909	-13.0255	-9.7924 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												339.6824 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												1742.9511 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution (space)												3.3968 (313)
Electricity used for heat distribution (water)												1.7239 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)												
mechanical ventilation fans (SFP = 0.7500)												114.3750 (330a)
Total electricity for the above, kWh/year												114.3750 (331)
Electricity for lighting (calculated in Appendix L)												140.9735 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-297.1906 (333)
Wind generation												0.0000 (334)
Hydro-electric generation (Appendix N)												0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (335)
Appendix Q - special features												
Energy saved or generated												-0.0000 (336)
Energy used												0.0000 (337)
Total delivered energy for all uses												2040.7914 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
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Efficiency of heat source Heat pump			330.0000 (367)
Space heating from Heat pump	102.9341	0.1594	16.4128 (367)
Efficiency of heat source Heat pump			440.0000 (367)
Water heating from Heat pump	396.1252	0.0000	0.0000 (368)
Electrical energy for heat distribution (space & water)	3.3968	0.0000	2.9993 (372)
Overall CO2 factor for heat network (space)			0.0499 (386)
Overall CO2 factor for heat network (water)			0.0335 (386)
Total CO2 associated with community systems			75.2695 (373)
Space and water heating			75.2695 (376)
Pumps, fans and electric keep-hot	114.3750	0.1387	15.8652 (378)
Energy for lighting	140.9735	0.1443	20.3468 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-297.1906	0.1331	-39.5632
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-39.5632 (380)
Total CO2, kg/year			71.9184 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.4400 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			330.0000 (467a)
Space heating from Heat pump	102.9341	1.5902	163.6868 (467)
Efficiency of heat source Heat pump			440.0000 (467b)
Water heating from Heat pump	396.1252	0.0000	0.0000 (468)
Electrical energy for heat distribution (space & water)	3.3968	0.0000	31.9190 (472)
Overall CO2 factor for heat network (space)			0.4978 (486)
Overall CO2 factor for heat network (water)			0.3610 (486)
Total CO2 associated with community systems			798.2735 (473)
Space and water heating			798.2735 (476)
Pumps, fans and electric keep-hot	114.3750	1.5128	173.0265 (478)
Energy for lighting	140.9735	1.5338	216.2298 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-297.1906	1.4919	-443.3844
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-443.3844 (480)
Total Primary energy kWh/year			744.1454 (483)
Dwelling Primary energy Rate (DPER)			14.8800 (484)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	50.0000 (1b)	2.5000 (2b)	125.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	125.0000 (5)

2. Ventilation rate

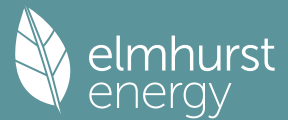
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1600 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4100 (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) = 0.3485 (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	0.4443	0.4356	0.4269	0.3834	0.3746	0.3311	0.3311	0.3224	0.3485	0.3746	0.3921	0.4095 (22b)
Effective ac	0.5987	0.5949	0.5911	0.5735	0.5702	0.5548	0.5548	0.5520	0.5607	0.5702	0.5769	0.5838 (25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K
---------	-------	----------	---------	---------	-------	---------	-------

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Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K						
TER Opening Type			8.6400	1.1450	9.8931			(27)					
Heatloss Floor 1			50.0000	0.1300	6.5000			(28a)					
External Wall 1	17.5000	8.6400	8.8600	0.1800	1.5948			(29a)					
Total net area of external elements Aum(A, m2)			67.5000					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.9879			(33)					
Main dwelling													
Party Wall hall			55.0000	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							366.4870	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
P1 Party wall - Ground floor				22.0000	0.0800	1.7600							
P4 Party wall - Roof (insulation at ceiling level)				22.0000	0.1200	2.6400							
E7 Party floor between dwellings (in blocks of flats)				7.0000	0.0700	0.4900							
E1 Steel lintel with perforated steel base plate				3.8800	0.0500	0.1940							
E3 Sill				3.8800	0.0500	0.1940							
E4 Jamb				8.8800	0.0500	0.4440							
E5 Ground floor (normal)				7.0000	0.1600	1.1200							
E18 Party wall between dwellings				10.0000	0.0600	0.6000							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.4420	(36)					
Point Thermal bridges							(36a) =	0.0000					
Total fabric heat loss							(33) + (36) + (36a) =	25.4299 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	24.6971	24.5390	24.3840	23.6560	23.5198	22.8857	22.8857	22.7683	23.1300	23.5198	23.7953	24.0834	(38)
Average = Sum(39)m / 12 =	50.1270	49.9689	49.8139	49.0859	48.9497	48.3156	48.3156	48.1982	48.5599	48.9497	49.2253	49.5133	(39)
												49.0853	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0025	0.9994	0.9963	0.9817	0.9790	0.9663	0.9663	0.9640	0.9712	0.9790	0.9845	0.9903	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	
												31	

4. Water heating energy requirements (kWh/year)													

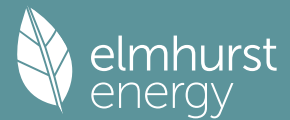
Assumed occupancy													1.6901 (42)
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	60.5412	59.6421	58.3759	56.0413	54.2933	52.3549	51.3079	52.5652	53.9342	56.0083	58.3909	60.3365	(42b)
Hot water usage for other uses													
	31.9383	30.7769	29.6155	28.4541	27.2927	26.1314	26.1314	27.2927	28.4541	29.6155	30.7769	31.9383	(42c)
Average daily hot water use (litres/day)													85.1660 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	92.4795	90.4190	87.9914	84.4955	81.5860	78.4863	77.4393	79.8580	82.3883	85.6238	89.1678	92.2748	(44)
Energy conte	146.4649	128.7554	135.2396	115.6701	109.8304	96.5080	93.6561	98.8808	101.5930	116.1907	127.0359	144.4801	(45)
Energy content (annual)													
										Total = Sum(45)m =		1414.3051	
Distribution loss (46)m = 0.15 x (45)m													
	21.9697	19.3133	20.2859	17.3505	16.4746	14.4762	14.0484	14.8321	15.2390	17.4286	19.0554	21.6720	(46)
Water storage loss (or HIU loss):													
Store volume													15.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													0.4337 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.2342 (55)
Total storage loss													
	7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595	(56)
If cylinder contains dedicated solar storage													
	7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	176.9868	156.3236	165.7615	145.2074	140.3524	126.0454	124.1780	129.4027	131.1304	146.7126	156.5733	175.0020	(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													
	176.9868	156.3236	165.7615	145.2074	140.3524	126.0454	124.1780	129.4027	131.1304	146.7126	156.5733	175.0020	(64)
12Total per year (kWh/year)													
										Total per year (kWh/year) = Sum(64)m =		1773.6762	(64)
Electric shower(s)												1774	(64)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													
Heat gains from water heating, kWh/month													
	73.1171	64.8657	69.3847	62.0902	60.9362	55.7188	55.5582	57.2954	57.4096	63.0509	65.8693	72.4572	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	76.3696	84.5520	76.3696	78.9152	76.3696	78.9152	76.3696	76.3696	78.9152	76.3696	78.9152	76.3696	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	147.2339	148.7618	144.9117	136.7153	126.3689	116.6447	110.1484	108.6205	112.4706	120.6670	131.0134	140.7376	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	(71)
Water heating gains (Table 5)													
	98.2757	96.5264	93.2590	86.2364	81.9034	77.3872	74.6750	77.0100	79.7355	84.7459	91.4852	97.3887	(72)
Total internal gains													
	373.2307	381.1917	365.8918	353.2184	335.9934	321.2987	309.5444	310.3516	319.4729	333.1340	352.7653	365.8473	(73)

6. Solar gains													

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[Jan]	Area m2				Solar flux Table 6a W/m2		g Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W	
Northwest	8.6400				11.2829		0.6300	0.7000		0.7700	29.7926 (81)	
Solar gains	29.7926	60.6436	109.2605	179.4372	241.1988	257.1434	240.5524	191.7712	133.1357	74.1113	37.4868	24.3301 (83)
Total gains	403.0233	441.8353	475.1523	532.6556	577.1922	578.4421	550.0968	502.1228	452.6085	407.2453	390.2521	390.1774 (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	101.5439	101.8653	102.1822	103.6977	103.9862	105.3509	105.3509	105.6076	104.8210	103.9862	103.4042	102.8026
alpha	7.7696	7.7910	7.8121	7.9132	7.9324	8.0234	8.0234	8.0405	7.9881	7.9324	7.8936	7.8535
util living area	0.9982	0.9957	0.9867	0.9298	0.7599	0.5329	0.3863	0.4412	0.7216	0.9606	0.9949	0.9986 (86)
MIT	20.3051	20.4171	20.5946	20.8419	20.9733	20.9985	20.9999	20.9997	20.9864	20.8110	20.5258	20.2921 (87)
Th 2	20.0812	20.0839	20.0864	20.0986	20.1009	20.1115	20.1115	20.1135	20.1074	20.1009	20.0963	20.0915 (88)
util rest of house	0.9974	0.9938	0.9803	0.9013	0.6978	0.4599	0.3084	0.3564	0.6375	0.9376	0.9920	0.9980 (89)
MIT 2	19.2833	19.4281	19.6534	19.9554	20.0835	20.1109	20.1115	20.1134	20.1009	19.9296	19.5770	19.2750 (90)
Living area fraction	19.7574	19.8870	20.0901	20.3667	20.4964	20.5227	20.5237	20.5247	20.5118	20.3386	20.0172	19.7469 (92)
MIT	19.7574	19.8870	20.0901	20.3667	20.4964	20.5227	20.5237	20.5247	20.5118	20.3386	20.0172	19.7469 (93)
Temperature adjustment												0.0000
adjusted MIT	19.7574	19.8870	20.0901	20.3667	20.4964	20.5227	20.5237	20.5247	20.5118	20.3386	20.0172	19.7469 (93)
8. Space heating requirement												
Utilisation	0.9970	0.9932	0.9804	0.9107	0.7260	0.4938	0.3446	0.3958	0.6767	0.9447	0.9917	0.9976 (94)
Useful gains	401.8148	438.8366	465.8238	485.0842	419.0386	285.6500	189.5523	198.7314	306.2850	384.7101	387.0134	389.2492 (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	774.8338	748.8840	676.9758	562.8548	430.5808	286.1611	189.5764	198.8013	311.3556	476.6999	635.8536	769.7810 (97)
Space heating kWh	277.5261	208.3518	157.0971	55.9948	8.5874	0.0000	0.0000	0.0000	0.0000	68.4404	179.1650	283.1157 (98a)
Space heating requirement - total per year (kWh/year)												1238.2782
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	277.5261	208.3518	157.0971	55.9948	8.5874	0.0000	0.0000	0.0000	0.0000	68.4404	179.1650	283.1157 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1238.2782
Space heating per m2										(98c) / (4) =		24.7656 (99)
9a. Energy requirements - Individual heating systems, including micro-CHP												
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Fraction of main heating from main system 2												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												88.8000 (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	277.5261	208.3518	157.0971	55.9948	8.5874	0.0000	0.0000	0.0000	0.0000	68.4404	179.1650	283.1157 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	300.6783	225.7333	170.2027	60.6661	9.3038	0.0000	0.0000	0.0000	0.0000	74.1500	194.1115	306.7342 (211)
Space heating efficiency (main heating system 2)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Space heating fuel used, main system 2												0.0000 (213)
Water heating												
Water heating requirement												
	176.9868	156.3236	165.7615	145.2074	140.3524	126.0454	124.1780	129.4027	131.1304	146.7126	156.5733	175.0020 (64)
Efficiency of water heater (217)m	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000 (216)
Fuel for water heating, kWh/month	221.7880	195.8943	207.7212	181.9642	175.8802	157.9516	155.6115	162.1588	164.3238	183.8504	196.2071	219.3008 (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	11.1260	10.0493	11.1260	10.7671	11.1260	10.7671	11.1260	11.1260	10.7671	11.1260	10.7671	11.1260 (231)
Lighting	15.8681	12.7300	11.4619	8.3975	6.4865	5.2995	5.9172	7.6914	9.9903	13.1078	14.8053	16.3091 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-6.0750	-9.4223	-14.8854	-18.4554	-21.4834	-20.6581	-20.4210	-18.4802	-15.3649	-11.4951	-6.9796	-5.1580 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-1.2459	-2.7330	-5.6465	-8.8048	-11.9633	-12.1286	-11.9735	-9.9787	-7.1180	-3.9983	-1.6922	-0.9764 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												

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(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1341.5799	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2222.6518	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												131.0000	(231)
Electricity for lighting (calculated in Appendix L)												128.0646	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-247.1375	(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												3576.1588	(238)

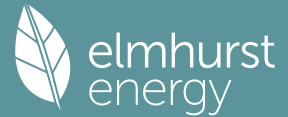
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1341.5799	0.2100	281.7318	(261)
Space heating - main system 2	0.0000	0.2100	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2222.6518	0.2100	466.7569	(264)
Space and water heating			748.4887	(265)
Pumps, fans and electric keep-hot	131.0000	0.1387	18.1713	(267)
Energy for lighting	128.0646	0.1443	18.4837	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-168.8783	0.1326	-22.3982	
PV Unit electricity exported	-78.2592	0.1248	-9.7703	
Total			-32.1685	(269)
Total CO2, kg/year			752.9752	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.0600	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1341.5799	1.1300	1515.9853	(275)
Space heating - main system 2	0.0000	1.1300	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2222.6518	1.1300	2511.5966	(278)
Space and water heating			4027.5819	(279)
Pumps, fans and electric keep-hot	131.0000	1.5128	198.1768	(281)
Energy for lighting	128.0646	1.5338	196.4297	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-168.8783	1.4901	-251.6391	
PV Unit electricity exported	-78.2592	0.4582	-35.8598	
Total			-287.4990	(283)
Total Primary energy kWh/year			4134.6894	(286)
Target Primary Energy Rate (TPER)			82.6900	(287)

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Plot Reference	00grd sample 5 Plot 05				Issued on Date	13/12/2025	
Assessment Reference	Block E 3B4P W			Plot Type Ref	Block F 3B4P W		
Plot Address					SAP Version	10.2	
SAP Rating	87 B	DER	1.68	TER	12.33		
Environmental	99 A	% DER < TER				86.37	
CO ₂ Emissions (t/year)	0.14	DFEE	32.87	TFEE	32.52		
Compliance Check	See BREL	% DFEE < TFEE				-1.08	
% DPER < TPER	74.06	DPER	17.40	TPER	67.07		
Assessor Details	Mr. Andrew Jones				Assessor ID	N955-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	97.0000 (1b)	2.5000 (2b)	242.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	97.0000		242.5000 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	242.5000 (5)

2. Ventilation rate

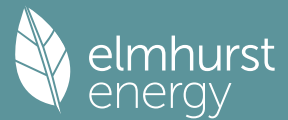
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												85.5000 (23c)
Effective ac	0.2351	0.2319	0.2287	0.2128	0.2096	0.1936	0.1936	0.1904	0.2000	0.2096	0.2159	0.2223 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows Open			11.3200	1.1450	12.9618		(27)
External Door			8.8400	1.2000	10.6080		(26)
Heatloss Floor 1			97.0000	0.1100	10.6700	110.0000	10670.0000 (28a)
External Wall 1	47.5000	20.1600	27.3400	0.1500	4.1010	70.0000	1913.8000 (29a)
Total net area of external elements Aum(A, m ²)			144.5000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 38.3408		(33)
Main dwelling							
Party Wall hall			63.5000	0.0000	0.0000	180.0000	11430.0000 (32)
Party Ceiling 1			97.0000			30.0000	2910.0000 (32b)
Internal Wall 1			208.8000			9.0000	1879.2000 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 28803.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							296.9381 (35)
Thermal bridges (User defined value 0.075 * total exposed area)							10.8375 (36)
Point Thermal bridges						(36a) =	0.0000

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Total fabric heat loss (33) + (36) + (36a) = 49.1783 (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	18.8109	18.5558	18.3007	17.0253	16.7702	15.4948	15.4948	15.2398	16.0050	16.7702	17.2804	17.7906 (38)
Heat transfer coeff	67.9892	67.7341	67.4790	66.2037	65.9486	64.6732	64.6732	64.4181	65.1833	65.9486	66.4587	66.9689 (39)
Average = Sum(39)m / 12 =												66.1399

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.7009	0.6983	0.6957	0.6825	0.6799	0.6667	0.6667	0.6641	0.6720	0.6799	0.6851	Dec 0.6904 (40)
HLP (average)												0.6819
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.7100 (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 80.3393 79.1461 77.4659 74.3679 72.0482 69.4759 68.0865 69.7550 71.5716 74.3240 77.4858 80.0677 (42b)

Hot water usage for other uses 42.3827 40.8416 39.3004 37.7592 36.2180 34.6768 34.6768 36.2180 37.7592 39.3004 40.8416 42.3827 (42c)

Average daily hot water use (litres/day) 113.0169 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	122.7220	119.9877	116.7663	112.1271	108.2661	104.1527	102.7633	105.9730	109.3308	113.6244	118.3274	122.4504 (44)
Energy conte	194.3616	170.8608	179.4654	153.4964	145.7470	128.0679	124.2833	131.2167	134.8158	154.1872	168.5790	191.7277 (45)
Energy content (annual)										Total = Sum(45)m =		1876.8089
Distribution loss (46)m = 0.15 x (45)m	29.1542	25.6291	26.9198	23.0245	21.8621	19.2102	18.6425	19.6825	20.2224	23.1281	25.2869	28.7592 (46)
Water storage loss (or HIU loss):												
Store volume												15.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2500 (48)
Temperature factor from Table 2b												0.6000 (49)
Enter (49) or (54) in (55)												0.1500 (55)
Total storage loss	4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500 (56)
If cylinder contains dedicated solar storage	4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	222.2740	196.0720	207.3778	180.5084	173.6594	155.0799	152.1957	159.1291	161.8278	182.0996	195.5910	219.6401 (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	222.2740	196.0720	207.3778	180.5084	173.6594	155.0799	152.1957	159.1291	161.8278	182.0996	195.5910	219.6401 (64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2205.4549 (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	86.9552	76.9802	82.0022	72.6471	70.7908	64.1922	63.6541	65.9595	66.4359	73.5972	77.6621	86.0794 (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	135.4982	135.4982	135.4982	135.4982	135.4982	135.4982	135.4982	135.4982	135.4982	135.4982	135.4982	135.4982 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	146.4038	162.0900	146.4038	151.2840	146.4038	151.2840	146.4038	146.4038	151.2840	146.4038	151.2840	146.4038 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	251.3846	253.9932	247.4196	233.4253	215.7600	199.1571	188.0654	185.4568	192.0303	206.0247	223.6900	240.2929 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.5498	36.5498	36.5498	36.5498	36.5498	36.5498	36.5498	36.5498	36.5498	36.5498	36.5498	36.5498 (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)	-108.3986	-108.3986	-108.3986	-108.3986	-108.3986	-108.3986	-108.3986	-108.3986	-108.3986	-108.3986	-108.3986	-108.3986 (71)
Water heating gains (Table 5)	116.8752	114.5538	110.2180	100.8988	95.1489	89.1558	85.5566	88.6552	92.2720	98.9209	107.8641	115.6981 (72)
Total internal gains	578.3131	594.2865	567.6909	549.2576	520.9623	503.2464	483.6753	484.1653	499.2358	514.9989	546.4875	566.0443 (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	8.2400	36.7938	0.4000	0.6000	0.7700	50.4251 (77)						
Southwest	3.0800	36.7938	0.4000	0.6000	0.7700	18.8482 (79)						
Solar gains	69.2733	117.9981	161.4501	200.0445	224.0665	222.4462	214.4619	196.5404	174.8163	130.4130	82.9735	59.2835 (83)
Total gains	647.5865	712.2846	729.1410	749.3021	745.0288	725.6926	698.1372	680.7057	674.0521	645.4119	629.4609	625.3278 (84)

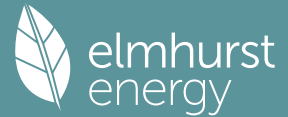
7. Mean internal temperature (heating season)

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	117.6780	118.1212	118.5677	120.8518	121.3193	123.7118	123.7118	124.2016	122.7435	121.3193	120.3880	119.4709
alpha	8.8452	8.8747	8.9045	9.0568	9.0880	9.2475	9.2475	9.2801	9.1829	9.0880	9.0259	8.9647

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util living area	0.9970	0.9920	0.9804	0.9279	0.7943	0.5690	0.4075	0.4352	0.6618	0.9260	0.9898	0.9977 (86)
MIT	20.4925	20.6020	20.7266	20.8900	20.9776	20.9990	21.0000	20.9999	20.9961	20.9082	20.6876	20.4798 (87)
Th 2	20.3400	20.3423	20.3447	20.3563	20.3586	20.3703	20.3703	20.3726	20.3656	20.3586	20.3540	20.3493 (88)
util rest of house												
MIT 2	0.9959	0.9892	0.9736	0.9059	0.7493	0.5137	0.3493	0.3759	0.6035	0.8996	0.9858	0.9969 (89)
Living area fraction	19.8783	19.9885	20.1120	20.2735	20.3454	20.3699	20.3703	20.3726	20.3639	20.2932	20.0835	19.8738 (90)
MIT	20.0627	20.1726	20.2965	20.4586	20.5351	20.5587	20.5593	20.5609	20.5537	FLA = Living area / (4) = 20.4777	20.2648	0.3001 (91)
Temperature adjustment												20.0557 (92)
adjusted MIT	20.0627	20.1726	20.2965	20.4586	20.5351	20.5587	20.5593	20.5609	20.5537	20.4777	20.2648	0.0000 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9954	0.9884	0.9730	0.9098	0.7621	0.5303	0.3668	0.3937	0.6210	0.9050	0.9851	0.9964	(94)
Useful gains	644.5895	703.9902	709.4484	681.6845	567.8189	384.8477	256.0429	268.0076	418.5708	584.0948	620.0723	623.0848	(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	1071.6913	1034.4770	930.9718	765.2184	582.6625	385.3674	256.0581	268.0361	420.6717	651.4234	874.9150	1061.8362	(97)
Space heating kWh	317.7637	222.0871	164.8134	60.1445	11.0436	0.0000	0.0000	0.0000	0.0000	50.0925	183.4868	326.4311	(98a)
Space heating requirement - total per year (kWh/year)												1335.8626	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	317.7637	222.0871	164.8134	60.1445	11.0436	0.0000	0.0000	0.0000	0.0000	50.0925	183.4868	326.4311	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1335.8626	
Space heating per m2										(98c) / (4) =		13.7718	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space												1.0000	(303a)
Fraction of heat from community Heat pump-Water												1.0000	(303b)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500	(305)
Distribution loss factor (Table 12c) for community heating system												1.0000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	317.7637	222.0871	164.8134	60.1445	11.0436	0.0000	0.0000	0.0000	0.0000	50.0925	183.4868	326.4311	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00													
307a	333.6519	233.1915	173.0540	63.1517	11.5958	0.0000	0.0000	0.0000	0.0000	52.5971	192.6611	342.7526	
Space heating requirement	333.6519	233.1915	173.0540	63.1517	11.5958	0.0000	0.0000	0.0000	0.0000	52.5971	192.6611	342.7526	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	222.2740	196.0720	207.3778	180.5084	173.6594	155.0799	152.1957	159.1291	161.8278	182.0996	195.5910	219.6401	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00													
310b	222.2740	196.0720	207.3778	180.5084	173.6594	155.0799	152.1957	159.1291	161.8278	182.0996	195.5910	219.6401	
Water heating fuel	222.2740	196.0720	207.3778	180.5084	173.6594	155.0799	152.1957	159.1291	161.8278	182.0996	195.5910	219.6401	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	16.6466	15.0357	16.6466	16.1096	16.6466	16.1096	16.6466	16.6466	16.1096	16.6466	16.1096	16.6466	(331)
Lighting	32.4896	26.0644	23.4681	17.1937	13.2809	10.8506	12.1153	15.7479	20.4550	26.8381	30.3135	33.3926	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-12.2205	-18.8917	-29.8051	-36.8867	-42.8233	-41.1229	-40.6059	-36.7660	-30.5991	-22.9735	-14.0072	-10.3782	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1402.6558	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												2205.4549	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution (space)												14.0266	(313)
Electricity used for heat distribution (water)												2.1964	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6625)													
mechanical ventilation fans (SFP = 0.6625)												196.0006	(330a)
Total electricity for the above, kWh/year												196.0006	(331)
Electricity for lighting (calculated in Appendix L)												262.2096	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-337.0801	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3729.2408	(338)

12b. Carbon dioxide emissions - Community heating scheme

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	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			330.0000 (367)
Space heating from Heat pump	425.0472	0.1575	66.9237 (367)
Efficiency of heat source Heat pump			440.0000 (367)
Water heating from Heat pump	501.2398	0.0000	0.0000 (368)
Electrical energy for heat distribution (space & water)	14.0266	0.0000	5.3208 (372)
Overall CO2 factor for heat network (space)			0.0493 (386)
Overall CO2 factor for heat network (water)			0.0335 (386)
Total CO2 associated with community systems			142.9801 (373)
Space and water heating			142.9801 (376)
Pumps, fans and electric keep-hot	196.0006	0.1387	27.1877 (378)
Energy for lighting	262.2096	0.1443	37.8450 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-337.0801	0.1327	-44.7263
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-44.7263 (380)
Total CO2, kg/year			163.2865 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.6800 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			330.0000 (467a)
Space heating from Heat pump	425.0472	1.5829	672.8016 (467)
Efficiency of heat source Heat pump			440.0000 (467b)
Water heating from Heat pump	501.2398	0.0000	0.0000 (468)
Electrical energy for heat distribution (space & water)	14.0266	0.0000	55.7656 (472)
Overall CO2 factor for heat network (space)			0.4955 (486)
Overall CO2 factor for heat network (water)			0.3611 (486)
Total CO2 associated with community systems			1491.3670 (473)
Space and water heating			1491.3670 (476)
Pumps, fans and electric keep-hot	196.0006	1.5128	296.5097 (478)
Energy for lighting	262.2096	1.5338	402.1859 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-337.0801	1.4903	-502.3439
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-502.3439 (480)
Total Primary energy kWh/year			1687.7188 (483)
Dwelling Primary energy Rate (DPER)			17.4000 (484)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	97.0000	2.5000	242.5000
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	97.0000		
Dwelling volume			

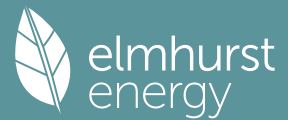
2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	30.0000 / (5) = 0.1237 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3737 (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) = 0.3177 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750
Adj infilt rate	0.4050	0.3971	0.3891	0.3494	0.3415	0.3018	0.3018	0.2938	0.3177	0.3415	0.3574	0.3732
Effective ac	0.5820	0.5788	0.5757	0.5610	0.5583	0.5455	0.5455	0.5432	0.5505	0.5583	0.5639	0.5697

3. Heat losses and heat loss parameter

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Element													
Main dwelling													
TER Opaque door						8.8400	1.0000		8.8400				(26)
TER Opening Type						11.3200	1.1450		12.9618				(27)
Heatloss Floor 1						97.0000	0.1300		12.6100				(28a)
External Wall 1						27.3400	0.1800		4.9212				(29a)
Total net area of external elements Aum(A, m2)						144.5000							(31)
Fabric heat loss, W/K = Sum (A x U)						(26)...(30) + (32) =			39.3330				(33)
Main dwelling													
Party Wall hall						63.5000	0.0000		0.0000				(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												296.9381	(35)
List of Thermal Bridges													
K1 Element								Length	Psi-value		Total		
P1 Party wall - Ground floor								25.0000	0.0800		2.0000		
P4 Party wall - Roof (insulation at ceiling level)								25.0000	0.1200		3.0000		
E7 Party floor between dwellings (in blocks of flats)								19.0000	0.0700		1.3300		
E1 Steel lintel with perforated steel base plate								10.3800	0.0500		0.5190		
E3 Sill								6.3600	0.0500		0.3180		
E4 Jamb								40.1600	0.0500		2.0080		
E5 Ground floor (normal)								19.0000	0.1600		3.0400		
E16 Corner (normal)								5.0000	0.0900		0.4500		
E18 Party wall between dwellings								5.0000	0.0600		0.3000		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												12.9650	(36)
Point Thermal bridges										(36a) =		0.0000	
Total fabric heat loss										(33) + (36) + (36a) =		52.2980	(37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	46.5759	46.3210	46.0712	44.8978	44.6783	43.6563	43.6563	43.4670	44.0499	44.6783	45.1224	45.5867	(38)
Average = Sum(39)m / 12 =	98.8739	98.6190	98.3692	97.1958	96.9763	95.9543	95.9543	95.7651	96.3480	96.9763	97.4204	97.8847	(39)
												97.1948	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0193	1.0167	1.0141	1.0020	0.9998	0.9892	0.9892	0.9873	0.9933	0.9998	1.0043	1.0091	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

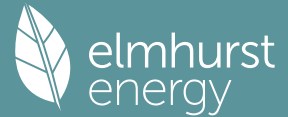
4. Water heating energy requirements (kWh/year)													

Assumed occupancy													2.7100 (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													
	80.3393	79.1461	77.4659	74.3679	72.0482	69.4759	68.0865	69.7550	71.5716	74.3240	77.4858	80.0677	(42b)
Hot water usage for other uses													
	42.3827	40.8416	39.3004	37.7592	36.2180	34.6768	34.6768	36.2180	37.7592	39.3004	40.8416	42.3827	(42c)
Average daily hot water use (litres/day)													113.0169 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	122.7220	119.9877	116.7663	112.1271	108.2661	104.1527	102.7633	105.9730	109.3308	113.6244	118.3274	122.4504	(44)
Energy conte	194.3616	170.8608	179.4654	153.4964	145.7470	128.0679	124.2833	131.2167	134.8158	154.1872	168.5790	191.7277	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
	29.1542	25.6291	26.9198	23.0245	21.8621	19.2102	18.6425	19.6825	20.2224	23.1281	25.2869	28.7592	(46)
Water storage loss (or HIU loss):													
Store volume													15.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													0.4337 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.2342 (55)
Total storage loss													
	7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595	(56)
If cylinder contains dedicated solar storage													
	7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	224.8836	198.4290	209.9873	183.0337	176.2690	157.6053	154.8053	161.7386	164.3532	184.7091	198.1164	222.2497	(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	224.8836	198.4290	209.9873	183.0337	176.2690	157.6053	154.8053	161.7386	164.3532	184.7091	198.1164	222.2497	(64)
12Total per year (kWh/year)													2236.1800 (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													
	89.0428	78.8658	84.0898	74.6674	72.8784	66.2125	65.7418	68.0471	68.4561	75.6848	79.6824	88.1670	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	141.6072	156.7794	141.6072	146.3275	141.6072	146.3275	141.6072	141.6072	146.3275	141.6072	146.3275	141.6072	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	251.3846	253.9932	247.4196	233.4253	215.7600	199.1571	188.0654	185.4568	192.0303	206.0247	223.6900	240.2929	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.5498	36.5498	36.5498	36.5498	36.5498	36.5498	36.5498	36.5498	36.5498	36.5498	36.5498	36.5498	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-108.3986	-108.3986	-108.3986	-108.3986	-108.3986	-108.3986	-108.3986	-108.3986	-108.3986	-108.3986	-108.3986	-108.3986	(71)
Water heating gains (Table 5)													
	119.6812	117.3598	113.0239	103.7047	97.9549	91.9618	88.3626	91.4611	95.0780	101.7269	110.6700	118.5040	(72)
Total internal gains													
	579.3225	594.7819	568.7002	550.1070	521.9716	501.0958	481.6846	482.1746	497.0852	516.0082	547.3369	567.0536	(73)

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6. Solar gains

[Jan]	Area				Solar flux	Specific data		g	FF	Access		Gains
	m2				Table 6a	or Table 6b		W/m2	or Table 6c	factor		W
					W/m2					Table 6d		
Southeast	8.2400				36.7938	0.6300			0.7000	0.7700		92.6561 (77)
Southwest	3.0800				36.7938	0.6300			0.7000	0.7700		34.6336 (79)
Solar gains	127.2897	216.8215	296.6646	367.5818	411.7222	408.7449	394.0737	361.1429	321.2250	239.6339	152.4637	108.9335 (83)
Total gains	706.6122	811.6033	865.3648	917.6888	933.6938	909.8407	875.7583	843.3175	818.3102	755.6421	699.8006	675.9870 (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	80.9196	81.1287	81.3347	82.3166	82.5030	83.3817	83.3817	83.5465	83.0410	82.5030	82.1269	81.7373
alpha	6.3946	6.4086	6.4223	6.4878	6.5002	6.5588	6.5588	6.5698	6.5361	6.5002	6.4751	6.4492
util living area	0.9975	0.9933	0.9837	0.9479	0.8512	0.6574	0.4800	0.5188	0.7629	0.9566	0.9932	0.9981 (86)
MIT	20.0700	20.2316	20.4344	20.6983	20.8944	20.9842	20.9982	20.9971	20.9600	20.7184	20.3508	20.0455 (87)
Th 2	20.0673	20.0694	20.0716	20.0817	20.0835	20.0923	20.0923	20.0940	20.0889	20.0835	20.0797	20.0757 (88)
util rest of house	0.9965	0.9908	0.9774	0.9277	0.7999	0.5723	0.3822	0.4187	0.6823	0.9355	0.9902	0.9974 (89)
MIT 2	18.9894	19.1967	19.4542	19.7839	19.9998	20.0844	20.0918	20.0931	20.0653	19.8144	19.3573	18.9645 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.3137	19.5073	19.7483	20.0583	20.2683	20.3544	20.3638	20.3644	20.3338	20.0857	19.6554	19.2889 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.3137	19.5073	19.7483	20.0583	20.2683	20.3544	20.3638	20.3644	20.3338	20.0857	19.6554	19.2889 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9954	0.9888	0.9746	0.9271	0.8112	0.5976	0.4117	0.4489	0.7053	0.9355	0.9883	0.9965 (94)
Useful gains	703.3855	802.5098	843.3456	850.7699	757.4059	543.7659	360.5198	378.5433	577.1702	706.9293	691.6205	673.6080 (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	1484.4632	1440.5568	1303.2282	1084.5409	830.9212	552.1620	361.1569	379.6486	600.6122	919.8844	1223.1551	1476.9761 (97)
Space heating kWh	581.1218	428.7676	342.1527	168.3151	54.6954	0.0000	0.0000	0.0000	0.0000	158.4385	382.7049	597.7059 (98a)
Space heating requirement - total per year (kWh/year)												2713.9019
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	581.1218	428.7676	342.1527	168.3151	54.6954	0.0000	0.0000	0.0000	0.0000	158.4385	382.7049	597.7059 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2713.9019
Space heating per m2												(98c) / (4) = 27.9784 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													92.3000 (206)
Efficiency of main space heating system 2 (in %)													88.8000 (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	581.1218	428.7676	342.1527	168.3151	54.6954	0.0000	0.0000	0.0000	0.0000	158.4385	382.7049	597.7059 (98)	
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)	
Space heating fuel (main heating system)	629.6010	464.5370	370.6963	182.3566	59.2583	0.0000	0.0000	0.0000	0.0000	171.6561	414.6316	647.5687 (211)	
Space heating efficiency (main heating system 2)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)	
Space heating fuel used, main system 2												0.0000 (213)	
Water heating													
Water heating requirement	224.8836	198.4290	209.9873	183.0337	176.2690	157.6053	154.8053	161.7386	164.3532	184.7091	198.1164	222.2497 (64)	
Efficiency of water heater	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000 (216)	
(217)m	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000 (217)	
Fuel for water heating, kWh/month	281.8090	248.6579	263.1420	229.3655	220.8884	197.5003	193.9916	202.6800	205.9563	231.4651	248.2661	278.5083 (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	11.1260	10.0493	11.1260	10.7671	11.1260	10.7671	11.1260	11.1260	10.7671	11.1260	10.7671	11.1260 (231)	
Lighting	29.4232	23.6044	21.2531	15.5709	12.0274	9.8265	10.9718	14.2616	18.5244	24.3050	27.4525	30.2409 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-11.5889	-17.8620	-28.0345	-34.5073	-39.9192	-38.2677	-37.8070	-34.3258	-28.7119	-21.6744	-13.2707	-9.8500 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.6138	-5.7191	-11.7975	-18.3774	-24.9674	-25.3384	-25.0383	-20.8845	-14.9050	-8.3828	-3.5526	-2.0508 (233b)	

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Electricity generated by wind turbines (Appendix M) (negative quantity)														
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)														
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year														
Space heating fuel - main system 1													2940.3055	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													79.8000	
Water heating fuel used													2802.2306	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:														
Total electricity for the above, kWh/year													131.0000	(231)
Electricity for lighting (calculated in Appendix L)													237.4619	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-479.4468	(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													5631.5512	(238)

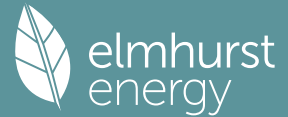
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2940.3055	0.2100	617.4641 (261)
Space heating - main system 2	0.0000	0.2100	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2802.2306	0.2100	588.4684 (264)
Space and water heating			1205.9326 (265)
Pumps, fans and electric keep-hot	131.0000	0.1387	18.1713 (267)
Energy for lighting	237.4619	0.1443	34.2731 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-315.8194	0.1328	-41.9332
PV Unit electricity exported	-163.6274	0.1248	-20.4284
Total			-62.3617 (269)
Total CO2, kg/year			1196.0153 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.3300 (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	2940.3055	1.1300	3322.5452 (275)
Space heating - main system 2	0.0000	1.1300	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2802.2306	1.1300	3166.5206 (278)
Space and water heating			6489.0657 (279)
Pumps, fans and electric keep-hot	131.0000	1.5128	198.1768 (281)
Energy for lighting	237.4619	1.5338	364.2270 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-315.8194	1.4906	-470.7646
PV Unit electricity exported	-163.6274	0.4582	-74.9779
Total			-545.7425 (283)
Total Primary energy kWh/year			6505.7270 (286)
Target Primary Energy Rate (TPER)			67.0700 (287)

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Plot Reference	02flr sample 1 Plot 06				Issued on Date	13/12/2025		
Assessment Reference	Block C 2B4P			Plot Type Ref	Block C 1 2B4P			
Plot Address					SAP Version	10.2		
SAP Rating	88 B		DER	1.25		TER	11.29	
Environmental	99 A		% DER < TER				88.93	
CO ₂ Emissions (t/year)	0.08		DFEE	22.13		TFEE	23.22	
Compliance Check	See BREL		% DFEE < TFEE				4.69	
% DPER < TPER	78.97		DPER	12.98		TPER	61.71	
Assessor Details	Mr. Andrew Jones				Assessor ID	N955-0001		
Client								

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	72.0000 (1b)	2.5000 (2b)	180.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.0000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	180.0000 (5)

2. Ventilation rate

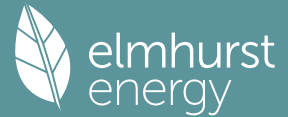
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												86.4000 (23c)
Effective ac	0.2306	0.2274	0.2242	0.2082	0.2051	0.1891	0.1891	0.1859	0.1955	0.2051	0.2114	0.2178 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows Open			14.8200	1.1450	16.9695		(27)
External Wall 1	45.0000	14.8200	30.1800	0.1500	4.5270	70.0000	2112.6000 (29a)
Total net area of external elements Aum(A, m ²)			45.0000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.4965		(33)
Main dwelling							
Party Wall hall			45.0000	0.0000	0.0000	180.0000	8100.0000 (32)
Party Floor 1			72.0000			40.0000	2880.0000 (32a)
Party Ceiling 1			72.0000			30.0000	2160.0000 (32b)
Internal Wall 1			123.8500			9.0000	1114.6500 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	16367.2500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							227.3229 (35)
Thermal bridges (User defined value 0.075 * total exposed area)							3.3750 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	24.8715 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	13.6954	13.5061	13.3167	12.3700	12.1807	11.2340	11.2340	11.0447	11.6127	12.1807	12.5594	12.9381	(38)
Heat transfer coeff	38.5669	38.3775	38.1882	37.2415	37.0522	36.1055	36.1055	35.9162	36.4842	37.0522	37.4309	37.8095	(39)
Average = Sum(39)m / 12 =												37.1942	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.5357	0.5330	0.5304	0.5172	0.5146	0.5015	0.5015	0.4988	0.5067	0.5146	0.5199	0.5251	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2937 (42)
Hot water usage for mixer showers													(42a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Hot water usage for baths													(42b)
72.2582	71.1851	69.6739	66.8875	64.8011	62.4876	61.2380	62.7386	64.3725	66.8480	69.6918	72.0139	72.0139	
Hot water usage for other uses													(42c)
38.1196	36.7335	35.3473	33.9611	32.5749	31.1888	31.1888	32.5749	33.9611	35.3473	36.7335	38.1196	38.1196	
Average daily hot water use (litres/day)												101.6490	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
110.3779	107.9185	105.0212	100.8486	97.3760	93.6764	92.4267	95.3135	98.3336	102.1953	106.4252	110.1336	110.1336	(44)
Energy conte	174.8115	153.6746	161.4136	138.0567	131.0869	115.1860	111.7821	118.0181	121.2552	138.6781	151.6223	172.4426	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
26.2217	23.0512	24.2120	20.7085	19.6630	17.2779	16.7673	17.7027	18.1883	20.8017	22.7433	25.8664	25.8664	(46)
Water storage loss (or HIU loss):													
Store volume												15.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2500	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.1500	(55)
Total storage loss													
4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.5000	4.6500	4.5000	4.6500	(56)
If cylinder contains dedicated solar storage													
4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
202.7239	178.8858	189.3260	165.0687	158.9993	142.1980	139.6945	145.9305	148.2672	166.5905	178.6343	200.3550	200.3550	(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	202.7239	178.8858	189.3260	165.0687	158.9993	142.1980	139.6945	145.9305	148.2672	166.5905	178.6343	200.3550	(64)
12Total per year (kWh/year)												2016.6737	(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	80.4548	71.2658	76.0000	67.5135	65.9163	59.9090	59.4975	61.5709	61.9270	68.4404	72.0240	79.6671	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
104.3619	115.5435	104.3619	107.8406	104.3619	107.8406	104.3619	107.8406	104.3619	107.8406	104.3619	107.8406	104.3619	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
201.9192	204.0145	198.7344	187.4938	173.3045	159.9686	151.0594	148.9641	154.2442	165.4848	179.6741	193.0100	193.0100	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	(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)													
-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	(71)
Water heating gains (Table 5)													
108.1381	106.0502	102.1505	93.7687	88.5972	83.2069	79.9697	82.7566	86.0097	91.9898	100.0333	107.0794	107.0794	(72)
Total internal gains	471.8245	483.0135	462.6520	446.5084	423.6689	408.4214	392.7963	393.4879	405.4997	419.2417	444.9533	461.8565	(73)

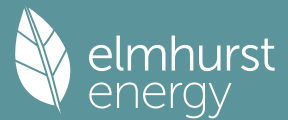
6. Solar gains

[Jan]												Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Southwest												7.1200	36.7938	0.4000	0.6000	0.7700	43.5712 (79)
Northwest												7.7000	11.2829	0.4000	0.6000	0.7700	14.4497 (81)
Solar gains	58.0209	103.6306	154.5404	212.8517	257.9158	264.6300	251.5612	216.6297	174.5271	117.9712	70.3697	49.0882 (83)					
Total gains	529.8453	586.6441	617.1925	659.3600	681.5847	673.0514	644.3575	610.1176	580.0268	537.2129	515.3230	510.9447 (84)					

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
117.8850	118.4666	119.0540	122.0804	122.7042	125.9215	125.9215	126.5853	124.6146	122.7042	121.4629	120.2464	120.2464	
alpha	8.8590	8.8978	8.9369	9.1387	9.1803	9.3948	9.3948	9.4390	9.3076	9.1803	9.0975	9.0164	
util living area													

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	0.9632	0.9207	0.8442	0.6766	0.5051	0.3433	0.2465	0.2708	0.4339	0.7074	0.9052	0.9690 (86)
MIT	20.7561	20.8581	20.9403	20.9918	20.9994	21.0000	21.0000	21.0000	20.9999	20.9902	20.9015	20.7439 (87)
Th 2	20.4883	20.4907	20.4931	20.5051	20.5075	20.5195	20.5195	20.5219	20.5147	20.5075	20.5026	20.4978 (88)
util rest of house												
	0.9559	0.9076	0.8237	0.6506	0.4785	0.3175	0.2196	0.2426	0.4034	0.6766	0.8884	0.9627 (89)
MIT 2	20.2733	20.3704	20.4456	20.4992	20.5071	20.5195	20.5195	20.5219	20.5146	20.5009	20.4224	20.2706 (90)
Living area fraction									flA = Living area / (4) =			0.4333 (91)
MIT	20.4825	20.5817	20.6599	20.7127	20.7204	20.7277	20.7277	20.7291	20.7249	20.7129	20.6300	20.4757 (92)
Temperature adjustment												0.0000
adjusted MIT	20.4825	20.5817	20.6599	20.7127	20.7204	20.7277	20.7277	20.7291	20.7249	20.7129	20.6300	20.4757 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9558	0.9101	0.8306	0.6616	0.4900	0.3287	0.2313	0.2548	0.4166	0.6896	0.8930	0.9624 (94)	
Useful gains	506.4226	533.8816	512.6482	436.2342	333.9808	221.2394	149.0329	155.4835	241.6632	370.4462	460.1585	491.7536 (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	624.1095	601.8263	540.7429	439.9214	334.2265	221.2437	149.0330	155.4838	241.7040	374.7055	506.4408	615.3773 (97)	
Space heating kWh	87.5591	45.6588	20.9024	2.6548	0.1828	0.0000	0.0000	0.0000	0.0000	3.1689	33.3232	91.9760 (98a)	
Space heating requirement - total per year (kWh/year)												285.4262	
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	87.5591	45.6588	20.9024	2.6548	0.1828	0.0000	0.0000	0.0000	0.0000	3.1689	33.3232	91.9760 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												285.4262	
Space heating per m2										(98c) / (4) =		3.9643 (99)	

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (301)
Fraction of space heat from community system													1.0000 (302)
Fraction of heat from community Heat pump-Space													1.0000 (303a)
Fraction of heat from community Heat pump-Water													1.0000 (303b)
Factor for control and charging method (Table 4c(3)) for space heating													1.0500 (305)
Distribution loss factor (Table 12c) for community heating system													1.0000 (306)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating:													
Space heating requirement	87.5591	45.6588	20.9024	2.6548	0.1828	0.0000	0.0000	0.0000	0.0000	3.1689	33.3232	91.9760 (98)	
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00													
307a	91.9370	47.9418	21.9476	2.7875	0.1920	0.0000	0.0000	0.0000	0.0000	3.3274	34.9894	96.5748	
Space heating requirement	91.9370	47.9418	21.9476	2.7875	0.1920	0.0000	0.0000	0.0000	0.0000	3.3274	34.9894	96.5748 (307)	
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)	
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)	
Water heating													
Annual water heating requirement	202.7239	178.8858	189.3260	165.0687	158.9993	142.1980	139.6945	145.9305	148.2672	166.5905	178.6343	200.3550 (64)	
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00													
310b	202.7239	178.8858	189.3260	165.0687	158.9993	142.1980	139.6945	145.9305	148.2672	166.5905	178.6343	200.3550	
Water heating fuel	202.7239	178.8858	189.3260	165.0687	158.9993	142.1980	139.6945	145.9305	148.2672	166.5905	178.6343	200.3550 (310)	
Cooling System Energy Efficiency Ratio	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (314)	
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)	
Pumps and Fa	13.9882	12.6345	13.9882	13.5370	13.9882	13.5370	13.9882	13.9882	13.5370	13.9882	13.5370	13.9882 (331)	
Lighting	23.1597	18.5796	16.7289	12.2563	9.4671	7.7347	8.6362	11.2257	14.5810	19.1311	21.6086	23.8034 (332)	
Electricity generated by PVs (Appendix M) (negative quantity)	-11.9263	-18.2748	-28.5856	-35.0719	-40.4529	-38.7606	-38.2768	-34.7811	-29.1288	-22.0985	-13.6157	-10.1456 (333a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)	
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)	
Annual totals kWh/year													
Space heating fuel - community heating												299.6975 (307)	
Space heating fuel - secondary												0.0000 (309)	
Water heating fuel - community heating												2016.6737 (310)	
Efficiency of water heater												0.0000 (311)	
Electricity used for heat distribution (space)												2.9970 (313)	
Electricity used for heat distribution (water)												2.0035 (313)	
Space cooling fuel												0.0000 (321)	
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)													
mechanical ventilation fans (SFP = 0.7500)												164.7000 (330a)	
Total electricity for the above, kWh/year												164.7000 (331)	
Electricity for lighting (calculated in Appendix L)												186.9124 (332)	
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-321.1189 (333)	
Wind generation												0.0000 (334)	
Hydro-electric generation (Appendix N)												0.0000 (335a)	
Electricity generated - Micro CHP (Appendix N)												0.0000 (335)	
Appendix Q - special features													
Energy saved or generated												-0.0000 (336)	
Energy used												0.0000 (337)	
Total delivered energy for all uses												2346.8648 (338)	

12b. Carbon dioxide emissions - Community heating scheme

Energy	Emission factor	Emissions
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	kWh/year	kg CO2/kWh	kg CO2/year
Efficiency of heat source Heat pump			330.0000 (367)
Space heating from Heat pump	90.8174	0.1599	14.5200 (367)
Efficiency of heat source Heat pump			440.0000 (367)
Water heating from Heat pump	458.3349	0.0000	0.0000 (368)
Electrical energy for heat distribution (space & water)	2.9970	0.0000	3.3243 (372)
Overall CO2 factor for heat network (space)			0.0500 (386)
Overall CO2 factor for heat network (water)			0.0335 (386)
Total CO2 associated with community systems			82.5070 (373)
Space and water heating			82.5070 (376)
Pumps, fans and electric keep-hot	164.7000	0.1387	22.8459 (378)
Energy for lighting	186.9124	0.1443	26.9772 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-321.1189	0.1329	-42.6609
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-42.6609 (380)
Total CO2, kg/year			89.6692 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.2500 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			330.0000 (467a)
Space heating from Heat pump	90.8174	1.5917	144.5583 (467)
Efficiency of heat source Heat pump			440.0000 (467b)
Water heating from Heat pump	458.3349	0.0000	0.0000 (468)
Electrical energy for heat distribution (space & water)	2.9970	0.0000	35.4577 (472)
Overall CO2 factor for heat network (space)			0.4983 (486)
Overall CO2 factor for heat network (water)			0.3611 (486)
Total CO2 associated with community systems			877.4543 (473)
Space and water heating			877.4543 (476)
Pumps, fans and electric keep-hot	164.7000	1.5128	249.1582 (478)
Energy for lighting	186.9124	1.5338	286.6925 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-321.1189	1.4909	-478.7543
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-478.7543 (480)
Total Primary energy kWh/year			934.5506 (483)
Dwelling Primary energy Rate (DPER)			12.9800 (484)

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

1. Overall dwelling characteristics

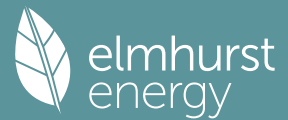
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	72.0000	2.5000	180.0000
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.0000		
Dwelling volume			

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	30.0000 / (5) = 0.1667 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4167 (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) = 0.3542 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000 (22)
Wind factor	1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 0.9500 0.9250 1.0000 1.0750 1.1750 1.1750 (22a)
Adj infilt rate	0.4516 0.4427 0.4339 0.3896 0.3807 0.3365 0.3365 0.3276 0.3542 0.3807 0.3984 0.4161 (22b)
Effective ac	0.6020 0.5980 0.5941 0.5759 0.5725 0.5566 0.5566 0.5537 0.5627 0.5725 0.5794 0.5866 (25)

3. Heat losses and heat loss parameter

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Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K						
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K						
TER Opening Type			14.8200	1.1450	16.9695		(27)						
External Wall 1	45.0000	14.8200	30.1800	0.1800	5.4324		(29a)						
Total net area of external elements Aum(A, m2)			45.0000				(31)						
Fabric heat loss, W/K = Sum (A x U)			(26)... (30) + (32) =		22.4019		(33)						
Main dwelling													
Party Wall hall			45.0000	0.0000	0.0000		(32)						
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							227.3229 (35)						
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				36.0000	0.0000	0.0000							
E7 Party floor between dwellings (in blocks of flats)				36.0000	0.0700	2.5200							
E1 Steel lintel with perforated steel base plate				7.4100	0.0500	0.3705							
E3 Sill				7.4100	0.0500	0.3705							
E4 Jamb				19.6000	0.0500	0.9800							
E16 Corner (normal)				5.0000	0.0900	0.4500							
E18 Party wall between dwellings				5.0000	0.0600	0.3000							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.9910 (36)						
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss					(33) + (36) + (36a) =		27.3929 (37)						
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	35.7561	35.5209	35.2904	34.2077	34.0052	33.0622	33.0622	32.8875	33.4254	34.0052	34.4149	34.8434	(38)
Average = Sum(39)m / 12 =	63.1490	62.9138	62.6833	61.6006	61.3980	60.4550	60.4550	60.2804	60.8183	61.3980	61.8078	62.2362	(39)
												61.5996	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.8771	0.8738	0.8706	0.8556	0.8528	0.8397	0.8397	0.8372	0.8447	0.8528	0.8584	0.8644	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

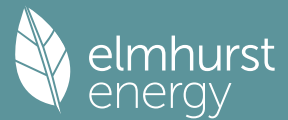
Assumed occupancy													2.2937 (42)
Hot water usage for mixer showers													
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for other uses	72.2582	71.1851	69.6739	66.8875	64.8011	62.4876	61.2380	62.7386	64.3725	66.8480	69.6918	72.0139	(42b)
Average daily hot water use (litres/day)	38.1196	36.7335	35.3473	33.9611	32.5749	31.1888	31.1888	32.5749	33.9611	35.3473	36.7335	38.1196	(42c)
												101.6490	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	110.3779	107.9185	105.0212	100.8486	97.3760	93.6764	92.4267	95.3135	98.3336	102.1953	106.4252	110.1336	(44)
Energy content (annual)	174.8115	153.6746	161.4136	138.0567	131.0869	115.1860	111.7821	118.0181	121.2552	138.6781	151.6223	172.4426	(45)
Distribution loss (46)m = 0.15 x (45)m	26.2217	23.0512	24.2120	20.7085	19.6630	17.2779	16.7673	17.7027	18.1883	20.8017	22.7433	25.8664	(46)
Water storage loss (or HIU loss):													
Store volume													15.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													0.4337 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.2342 (55)
Total storage loss	7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595	(56)
If cylinder contains dedicated solar storage	7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	205.3335	181.2428	191.9356	167.5941	161.6088	144.7234	142.3041	148.5400	150.7925	169.2000	181.1596	202.9645	(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	205.3335	181.2428	191.9356	167.5941	161.6088	144.7234	142.3041	148.5400	150.7925	169.2000	181.1596	202.9645	(64)
12Total per year (kWh/year)													2047.3988 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Heat gains from water heating, kWh/month	82.5424	73.1513	78.0876	69.5337	68.0039	61.9292	61.5851	63.6586	63.9472	70.5280	74.0443	81.7547	(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	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	102.2834	113.2423	102.2834	105.6928	102.2834	105.6928	102.2834	102.2834	105.6928	102.2834	105.6928	102.2834	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.9192	204.0145	198.7344	187.4938	173.3045	159.9686	151.0594	148.9641	154.2442	165.4848	179.6741	193.0100	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	(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)	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	(71)
Water heating gains (Table 5)	110.9441	108.8562	104.9564	96.5746	91.4031	86.0128	82.7757	85.5626	88.8156	94.7957	102.8393	109.8853	(72)
Total internal gains	475.5518	486.5182	466.3794	450.1665	427.3963	409.0795	393.5237	394.2153	406.1578	422.9691	448.6114	465.5839	(73)

6. Solar gains

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[Jan]	Area m2				Solar flux Table 6a W/m2	Specific data or Table 6b		g	Specific data or Table 6c	FF	Access factor Table 6d		Gains W
Southwest	7.1200				36.7938	0.6300			0.7000		0.7700		80.0621 (79)
Northwest	7.7000				11.2829	0.6300			0.7000		0.7700		26.5512 (81)
Solar gains	106.6133	190.4212	283.9681	391.1149	473.9203	486.2576	462.2438	398.0571	320.6936	216.7721	129.3043	90.1995 (83)	
Total gains	582.1652	676.9393	750.3475	841.2814	901.3166	895.3371	855.7675	792.2724	726.8514	639.7412	577.9157	555.7835 (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	71.9958	72.2649	72.5306	73.8054	74.0489	75.2040	75.2040	75.4218	74.7548	74.0489	73.5580	73.0516	
alpha	5.7997	5.8177	5.8354	5.9204	5.9366	6.0136	6.0136	6.0281	5.9837	5.9366	5.9039	5.8701	
util living area	0.9855	0.9660	0.9220	0.7990	0.6174	0.4306	0.3106	0.3496	0.5680	0.8550	0.9663	0.9884 (86)	
MIT	20.1851	20.3913	20.6316	20.8755	20.9752	20.9976	20.9997	20.9995	20.9884	20.8441	20.4885	20.1568 (87)	
Th 2	20.1870	20.1898	20.1926	20.2054	20.2078	20.2191	20.2191	20.2212	20.2148	20.2078	20.2030	20.1979 (88)	
util rest of house	0.9817	0.9578	0.9045	0.7640	0.5698	0.3787	0.2556	0.2906	0.5071	0.8189	0.9567	0.9853 (89)	
MIT 2	19.2482	19.5075	19.8015	20.0882	20.1886	20.2177	20.2190	20.2210	20.2075	20.0636	19.6420	19.2211 (90)	
Living area fraction	fLA = Living area / (4) = 0.4333 (91)												
MIT	19.6542	19.8905	20.1612	20.4293	20.5295	20.5557	20.5573	20.5583	20.5459	20.4018	20.0088	19.6266 (92)	
Temperature adjustment	0.0000												
adjusted MIT	19.6542	19.8905	20.1612	20.4293	20.5295	20.5557	20.5573	20.5583	20.5459	20.4018	20.0088	19.6266 (93)	
8. Space heating requirement													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9786	0.9542	0.9037	0.7743	0.5894	0.4011	0.2795	0.3162	0.5331	0.8284	0.9540	0.9826 (94)	
Useful gains	569.7060	645.9536	678.1124	651.4005	531.2278	359.1494	239.1586	250.4984	387.4767	529.9758	551.3137	546.1012 (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	969.6005	943.1066	856.3272	710.2132	542.1117	360.0501	239.2395	250.6649	392.0283	601.8126	797.8670	960.0919 (97)	
Space heating kWh	297.5216	199.6868	132.5918	42.3451	8.0976	0.0000	0.0000	0.0000	0.0000	53.4466	177.5184	308.0091 (98a)	
Space heating requirement - total per year (kWh/year)													1219.2170
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	297.5216	199.6868	132.5918	42.3451	8.0976	0.0000	0.0000	0.0000	0.0000	53.4466	177.5184	308.0091 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)													1219.2170
Space heating per m2	(98c) / (4) =												16.9336 (99)
9a. Energy requirements - Individual heating systems, including micro-CHP													
Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													92.3000 (206)
Efficiency of main space heating system 2 (in %)													88.8000 (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	297.5216	199.6868	132.5918	42.3451	8.0976	0.0000	0.0000	0.0000	0.0000	53.4466	177.5184	308.0091 (98)	
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)	
Space heating fuel (main heating system)	322.3419	216.3454	143.6531	45.8777	8.7732	0.0000	0.0000	0.0000	0.0000	57.9054	192.3276	333.7043 (211)	
Space heating efficiency (main heating system 2)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)	
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
Water heating													
Water heating requirement	205.3335	181.2428	191.9356	167.5941	161.6088	144.7234	142.3041	148.5400	150.7925	169.2000	181.1596	202.9645 (64)	
Efficiency of water heater (217)m	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000 (216)	
Fuel for water heating, kWh/month	257.3101	227.1213	240.5208	210.0176	202.5173	181.3576	178.3259	186.1404	188.9631	212.0301	227.0171	254.3415 (219)	
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	11.1260	10.0493	11.1260	10.7671	11.1260	10.7671	11.1260	11.1260	10.7671	11.1260	10.7671	11.1260 (231)	
Lighting	21.2525	17.0495	15.3512	11.2469	8.6875	7.0977	7.9250	10.3012	13.3803	17.5556	19.8290	21.8431 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-8.6791	-13.4226	-21.1422	-26.1264	-30.3253	-29.1161	-28.7694	-26.0703	-21.7346	-16.3296	-9.9548	-7.3722 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity)	-1.8631	-4.0809	-8.4238	-13.1283	-17.8380	-18.0967	-17.8786	-14.9106	-10.6408	-5.9809	-2.5326	-1.4613 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	

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(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1320.9285	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2565.6626	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												131.0000	(231)
Electricity for lighting (calculated in Appendix L)												171.5195	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-355.8780	(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												3833.2326	(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	1320.9285	0.2100	277.3950 (261)
Space heating - main system 2	0.0000	0.2100	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2565.6626	0.2100	538.7892 (264)
Space and water heating			816.1841 (265)
Pumps, fans and electric keep-hot	131.0000	0.1387	18.1713 (267)
Energy for lighting	171.5195	0.1443	24.7556 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-239.0425	0.1327	-31.7206
PV Unit electricity exported	-116.8356	0.1248	-14.5859
Total			-46.3065 (269)
Total CO2, kg/year			812.8045 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.2900 (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	1320.9285	1.1300	1492.6492 (275)
Space heating - main system 2	0.0000	1.1300	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2565.6626	1.1300	2899.1988 (278)
Space and water heating			4391.8480 (279)
Pumps, fans and electric keep-hot	131.0000	1.5128	198.1768 (281)
Energy for lighting	171.5195	1.5338	263.0824 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-239.0425	1.4903	-356.2502
PV Unit electricity exported	-116.8356	0.4582	-53.5344
Total			-409.7847 (283)
Total Primary energy kWh/year			4443.3225 (286)
Target Primary Energy Rate (TPER)			61.7100 (287)

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Plot Reference	02fir sample 2 Plot 07			Issued on Date	13/12/2025		
Assessment Reference	Block C 2B4P		Plot Type Ref	Block C 2B4P			
Plot Address				SAP Version	10.2		
SAP Rating	87 B		DER	1.26		TER	11.23
Environmental	99 A		% DER < TER				88.78
CO ₂ Emissions (t/year)	0.07		DFEE	21.96		TFEE	21.83
Compliance Check	See BREL		% DFEE < TFEE				-0.61
% DPER < TPER	78.66		DPER	13.12		TPER	61.50
Assessor Details	Mr. Andrew Jones				Assessor ID	N955-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	68.0000 (1b)	2.5000 (2b)	170.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	170.0000 (5)

2. Ventilation rate

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

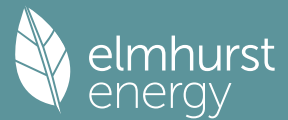
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												86.4000 (23c)
Effective ac	0.2306	0.2274	0.2242	0.2082	0.2051	0.1891	0.1891	0.1859	0.1955	0.2051	0.2114	0.2178 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows Open			13.6300	1.1450	15.6069		(27)
External Wall 1	47.5000	13.6300	33.8700	0.1500	5.0805	70.0000	2370.9000 (29a)
Total net area of external elements Aum(A, m ²)			47.5000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.6874		(33)
Main dwelling							
Party Wall hall			47.5000	0.0000	0.0000	180.0000	8550.0000 (32)
Party Floor 1			68.0000			40.0000	2720.0000 (32a)
Party Ceiling 1			68.0000			30.0000	2040.0000 (32b)
Internal Wall 1			270.0000			9.0000	2430.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	18110.9000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							266.3368 (35)
Thermal bridges (User defined value 0.075 * total exposed area)							3.5625 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	24.2499 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.9346	12.7557	12.5769	11.6828	11.5040	10.6099	10.6099	10.4311	10.9675	11.5040	11.8616	12.2193	(38)
Heat transfer coeff	37.1844	37.0056	36.8268	35.9327	35.7539	34.8598	34.8598	34.6810	35.2174	35.7539	36.1115	36.4692	(39)
Average = Sum(39)m / 12 =												35.8880	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.5468	0.5442	0.5416	0.5284	0.5258	0.5126	0.5126	0.5100	0.5179	0.5258	0.5311	0.5363	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.1966 (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	70.3737	69.3286	67.8568	65.1431	63.1111	60.8579	59.6409	61.1024	62.6937	65.1046	67.8742	70.1358	(42b)
Hot water usage for other uses	37.1254	35.7754	34.4254	33.0754	31.7254	30.3754	30.3754	31.7254	33.0754	34.4254	35.7754	37.1254	(42c)
Average daily hot water use (litres/day)												98.9979	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	107.4992	105.1040	102.2822	98.2185	94.8364	91.2333	90.0162	92.8277	95.7691	99.5300	103.6496	107.2613	(44)
Energy content (annual)	170.2524	149.6667	157.2039	134.4562	127.6681	112.1820	108.8668	114.9401	118.0928	135.0613	147.6679	167.9452	(45)
Distribution loss (46)m = 0.15 x (45)m	25.5379	22.4500	23.5806	20.1684	19.1502	16.8273	16.3300	17.2410	17.7139	20.2592	22.1502	25.1918	(46)
Water storage loss (or HIU loss):													
Store volume												15.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2500	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.1500	(55)
Total storage loss	4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500	(56)
If cylinder contains dedicated solar storage	4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	198.1648	174.8779	185.1163	161.4682	155.5805	139.1940	136.7792	142.8525	145.1048	162.9737	174.6799	195.8576	(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	198.1648	174.8779	185.1163	161.4682	155.5805	139.1940	136.7792	142.8525	145.1048	162.9737	174.6799	195.8576	(64)
12Total per year (kWh/year)												1972.6494	(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	78.9388	69.9331	74.6002	66.3163	64.7796	58.9101	58.5281	60.5475	60.8755	67.2378	70.7092	78.1717	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	99.9944	110.7081	99.9944	103.3276	99.9944	103.3276	99.9944	99.9944	103.3276	99.9944	103.3276	99.9944	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	192.5849	194.5833	189.5473	178.8263	165.2930	152.5736	144.0762	142.0778	147.1138	157.8348	171.3681	184.0875	(68)
Pumps, fans	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830	(69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Water heating gains (Table 5)	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	(71)
Total internal gains	106.1006	104.0672	100.2691	92.1059	87.0693	81.8196	78.6669	81.3811	84.5493	90.3734	98.2072	105.0695	(72)
	454.6290	465.3077	445.7600	430.2090	408.3059	393.6699	378.6866	379.4024	390.9397	404.1517	428.8520	445.1006	(73)

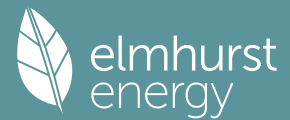
6. Solar gains

[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	8.2400	11.2829	0.4000	0.6000	0.7700	15.4630 (75)						
											Southeast	5.3900	36.7938	0.4000	0.6000	0.7700	32.9844 (77)						
Solar gains											48.4474	87.6600	133.5829	188.3828	231.8765	239.3806	226.9678	193.1159	152.3389	100.5614	58.9641	40.8556 (83)	
Total gains											503.0764	552.9677	579.3429	618.5918	640.1823	633.0505	605.6544	572.5183	543.2786	504.7131	487.8161	485.9562 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
alpha	135.2933	135.9471	136.6072	140.0064	140.7066	144.3155	144.3155	145.0596	142.8499	140.7066	139.3131	137.9469	
util living area	10.0196	10.0631	10.1071	10.3338	10.3804	10.6210	10.6210	10.6706	10.5233	10.3804	10.2875	10.1965	

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	0.9745	0.9396	0.8686	0.6973	0.5191	0.3524	0.2533	0.2787	0.4472	0.7283	0.9238	0.9790 (86)
MIT	20.7811	20.8724	20.9484	20.9942	20.9997	21.0000	21.0000	21.0000	21.0000	20.9929	20.9139	20.7703 (87)
Th 2	20.4781	20.4805	20.4829	20.4948	20.4972	20.5093	20.5093	20.5117	20.5044	20.4972	20.4924	20.4877 (88)
util rest of house	0.9683	0.9274	0.8477	0.6698	0.4912	0.3254	0.2250	0.2491	0.4151	0.6958	0.9074	0.9737 (89)
MIT 2	20.2865	20.3737	20.4429	20.4910	20.4971	20.5093	20.5093	20.5117	20.5044	20.4927	20.4237	20.2850 (90)
Living area fraction									flA = Living area /	(4) =		0.4044 (91)
MIT	20.4865	20.5754	20.6474	20.6945	20.7003	20.7077	20.7077	20.7092	20.7048	20.6950	20.6219	20.4813 (92)
Temperature adjustment												0.0000
adjusted MIT	20.4865	20.5754	20.6474	20.6945	20.7003	20.7077	20.7077	20.7092	20.7048	20.6950	20.6219	20.4813 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9684	0.9298	0.8546	0.6807	0.5025	0.3363	0.2364	0.2610	0.4281	0.7087	0.9119	0.9737	(94)
Useful gains	487.1768	514.1333	495.0824	421.0900	321.6703	212.9123	143.1942	149.4455	232.5872	357.6974	444.8176	473.1600	(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	601.8875	580.0769	521.0016	423.8075	321.7972	212.9137	143.1942	149.4455	232.6048	360.9348	488.2970	593.7646	(97)
Space heating kWh	85.3448	44.3140	19.2839	1.9566	0.0944	0.0000	0.0000	0.0000	0.0000	2.4086	31.3052	89.7298	(98a)
Space heating requirement - total per year (kWh/year)												274.4373	
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	85.3448	44.3140	19.2839	1.9566	0.0944	0.0000	0.0000	0.0000	0.0000	2.4086	31.3052	89.7298	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												274.4373	
Space heating per m2										(98c) / (4) =		4.0358	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (301)
Fraction of space heat from community system													1.0000 (302)
Fraction of heat from community Heat pump-Space													1.0000 (303a)
Fraction of heat from community Heat pump-Water													1.0000 (303b)
Factor for control and charging method (Table 4c(3)) for space heating													1.0500 (305)
Distribution loss factor (Table 12c) for community heating system													1.0000 (306)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating:													
Space heating requirement	85.3448	44.3140	19.2839	1.9566	0.0944	0.0000	0.0000	0.0000	0.0000	2.4086	31.3052	89.7298	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00													
307a	89.6120	46.5297	20.2481	2.0544	0.0992	0.0000	0.0000	0.0000	0.0000	2.5290	32.8704	94.2163	
Space heating requirement	89.6120	46.5297	20.2481	2.0544	0.0992	0.0000	0.0000	0.0000	0.0000	2.5290	32.8704	94.2163	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)													0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	198.1648	174.8779	185.1163	161.4682	155.5805	139.1940	136.7792	142.8525	145.1048	162.9737	174.6799	195.8576	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00													
310b	198.1648	174.8779	185.1163	161.4682	155.5805	139.1940	136.7792	142.8525	145.1048	162.9737	174.6799	195.8576	
Water heating fuel	198.1648	174.8779	185.1163	161.4682	155.5805	139.1940	136.7792	142.8525	145.1048	162.9737	174.6799	195.8576	(310)
Cooling System Energy Efficiency Ratio	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	13.2111	11.9326	13.2111	12.7849	13.2111	12.7849	13.2111	13.2111	12.7849	13.2111	12.7849	13.2111	(331)
Lighting	22.1905	17.8021	16.0288	11.7434	9.0709	7.4110	8.2748	10.7559	13.9708	18.3305	20.7043	22.8073	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-11.8619	-18.1398	-28.3178	-34.6720	-39.9286	-38.2367	-37.7614	-34.3446	-28.8078	-21.9081	-13.5305	-10.0948	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												288.1591	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												1972.6494	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution (space)												2.8816	(313)
Electricity used for heat distribution (water)												1.9586	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)													
mechanical ventilation fans (SFP = 0.7500)												155.5500	(330a)
Total electricity for the above, kWh/year												155.5500	(331)
Electricity for lighting (calculated in Appendix L)												179.0903	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-317.6040	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												2277.8448	(338)

12b. Carbon dioxide emissions - Community heating scheme

Energy	Emission factor	Emissions
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	kWh/year	kg CO2/kWh	kg CO2/year
Efficiency of heat source Heat pump			330.0000 (367)
Space heating from Heat pump	87.3210	0.1601	13.9761 (367)
Efficiency of heat source Heat pump			440.0000 (367)
Water heating from Heat pump	448.3294	0.0000	0.0000 (368)
Electrical energy for heat distribution (space & water)	2.8816	0.0000	3.2441 (372)
Overall CO2 factor for heat network (space)			0.0501 (386)
Overall CO2 factor for heat network (water)			0.0335 (386)
Total CO2 associated with community systems			80.4666 (373)
Space and water heating			80.4666 (376)
Pumps, fans and electric keep-hot	155.5500	0.1387	21.5767 (378)
Energy for lighting	179.0903	0.1443	25.8483 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-317.6040	0.1329	-42.2063
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-42.2063 (380)
Total CO2, kg/year			85.6853 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.2600 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			330.0000 (467a)
Space heating from Heat pump	87.3210	1.5924	139.0481 (467)
Efficiency of heat source Heat pump			440.0000 (467b)
Water heating from Heat pump	448.3294	0.0000	0.0000 (468)
Electrical energy for heat distribution (space & water)	2.8816	0.0000	34.6052 (472)
Overall CO2 factor for heat network (space)			0.4985 (486)
Overall CO2 factor for heat network (water)			0.3610 (486)
Total CO2 associated with community systems			855.8491 (473)
Space and water heating			855.8491 (476)
Pumps, fans and electric keep-hot	155.5500	1.5128	235.3160 (478)
Energy for lighting	179.0903	1.5338	274.6946 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-317.6040	1.4910	-473.5602
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-473.5602 (480)
Total Primary energy kWh/year			892.2996 (483)
Dwelling Primary energy Rate (DPER)			13.1200 (484)

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	68.0000 (1b)	x 2.5000 (2b)	= 170.0000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	170.0000 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1176 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3676 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3125 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000 (22)
Wind factor	1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 0.9500 0.9250 1.0000 1.0750 1.1250 1.1750 (22a)
Adj infilt rate	0.3984 0.3906 0.3828 0.3438 0.3359 0.2969 0.2969 0.2891 0.3125 0.3359 0.3516 0.3672 (22b)
Effective ac	0.5794 0.5763 0.5733 0.5591 0.5564 0.5441 0.5441 0.5418 0.5488 0.5564 0.5618 0.5674 (25)

3. Heat losses and heat loss parameter

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Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K						
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K						
TER Opening Type			13.6300	1.1450	15.6069		(27)						
External Wall 1	47.5000	13.6300	33.8700	0.1800	6.0966		(29a)						
Total net area of external elements Aum(A, m2)			47.5000				(31)						
Fabric heat loss, W/K = Sum (A x U)			(26)... (30) + (32) =		21.7035		(33)						
Main dwelling													
Party Wall hall			47.5000	0.0000	0.0000		(32)						
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							266.3368 (35)						
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				38.0000	0.0000	0.0000							
E1 Steel lintel with perforated steel base plate				6.1100	0.0500	0.3055							
E3 Sill				6.1100	0.0500	0.3055							
E4 Jamb				17.9000	0.0500	0.8950							
E7 Party floor between dwellings (in blocks of flats)				19.0000	0.0700	1.3300							
E16 Corner (normal)				2.5000	0.0900	0.2250							
E18 Party wall between dwellings				5.0000	0.0600	0.3000							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.3610 (36)						
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	25.0645 (37)						
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	32.5030	32.3301	32.1606	31.3645	31.2156	30.5222	30.5222	30.3938	30.7893	31.2156	31.5169	31.8319	(38)
Average = Sum(39)m / 12 =	57.5675	57.3946	57.2251	56.4290	56.2800	55.5867	55.5867	55.4582	55.8537	56.2800	56.5813	56.8964	(39)
												56.4283	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.8466	0.8440	0.8415	0.8298	0.8276	0.8175	0.8175	0.8156	0.8214	0.8276	0.8321	0.8367	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

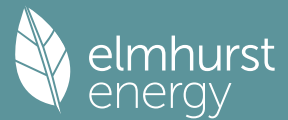
Assumed occupancy													2.1966 (42)
Hot water usage for mixer showers													
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for other uses	70.3737	69.3286	67.8568	65.1431	63.1111	60.8579	59.6409	61.1024	62.6937	65.1046	67.8742	70.1358	(42b)
Average daily hot water use (litres/day)	37.1254	35.7754	34.4254	33.0754	31.7254	30.3754	30.3754	31.7254	33.0754	34.4254	35.7754	37.1254	(42c)
												98.9979	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	107.4992	105.1040	102.2822	98.2185	94.8364	91.2333	90.0162	92.8277	95.7691	99.5300	103.6496	107.2613	(44)
Energy content (annual)	170.2524	149.6667	157.2039	134.4562	127.6681	112.1820	108.8668	114.9401	118.0928	135.0613	147.6679	167.9452	(45)
Distribution loss (46)m = 0.15 x (45)m	25.5379	22.4500	23.5806	20.1684	19.1502	16.8273	16.3300	17.2410	17.7139	20.2592	22.1502	25.1918	(46)
Water storage loss (or HIU loss):													
Store volume													15.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													0.4337 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.2342 (55)
Total storage loss	7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595	(56)
If cylinder contains dedicated solar storage	7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	200.7743	177.2349	187.7258	163.9935	158.1900	141.7193	139.3888	145.4621	147.6302	165.5832	177.2053	198.4671	(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	200.7743	177.2349	187.7258	163.9935	158.1900	141.7193	139.3888	145.4621	147.6302	165.5832	177.2053	198.4671	(64)
12Total per year (kWh/year)													2003.3745 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Heat gains from water heating, kWh/month	81.0265	71.8187	76.6878	68.3366	66.8672	60.9304	60.6158	62.6351	62.8957	69.3254	72.7295	80.2593	(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	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	97.7989	108.2773	97.7989	101.0588	97.7989	101.0588	97.7989	97.7989	101.0588	97.7989	101.0588	97.7989	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	192.5849	194.5833	189.5473	178.8263	165.2930	152.5736	144.0762	142.0778	147.1138	157.8348	171.3681	184.0875	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830	(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)	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	(71)
Water heating gains (Table 5)	108.9065	106.8731	103.0751	94.9119	89.8752	84.6255	81.4728	84.1870	87.3552	93.1793	101.0131	107.8754	(72)
Total internal gains	458.2394	468.6828	449.3704	433.7462	411.9162	394.2071	379.2970	380.0128	391.4769	407.7621	432.3892	448.7109	(73)

6. Solar gains

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[Jan]	Area m2				Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
Northeast	8.2400				11.2829	0.6300		0.7000		0.7700	28.4133 (75)
Southeast	5.3900				36.7938	0.6300		0.7000		0.7700	60.6088 (77)
Solar gains	89.0221	161.0752	245.4585	346.1534	426.0731	439.8619	417.0533	354.8505	279.9227	184.7815	75.0722 (83)
Total gains	547.2615	629.7581	694.8289	779.8996	837.9893	834.0689	796.3503	734.8633	671.3997	592.5436	523.7831 (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
tau	87.3897	87.6530	87.9126	89.1529	89.3888	90.5038	90.5038	90.7134	90.0711	89.3888	88.9128
alpha	6.8260	6.8435	6.8608	6.9435	6.9593	7.0336	7.0336	7.0476	7.0047	6.9593	6.9275
util living area	0.9907	0.9757	0.9360	0.8091	0.6155	0.4259	0.3071	0.3470	0.5689	0.8689	0.9754
MIT	20.3367	20.5100	20.7159	20.9178	20.9879	20.9992	20.9999	20.9998	20.9946	20.8882	20.5891
Th 2	20.2131	20.2153	20.2175	20.2275	20.2294	20.2382	20.2382	20.2399	20.2348	20.2294	20.2256
util rest of house	0.9878	0.9688	0.9194	0.7728	0.5677	0.3755	0.2539	0.2898	0.5081	0.8321	0.9672
MIT 2	19.4509	19.6691	19.9204	20.1533	20.2207	20.2378	20.2382	20.2398	20.2318	20.1298	19.7784
Living area fraction	19.8091	20.0092	20.2421	20.4625	20.5310	20.5457	20.5463	20.5472	20.5403	20.4365	20.1063
MIT	19.8091	20.0092	20.2421	20.4625	20.5310	20.5457	20.5463	20.5472	20.5403	20.4365	20.1063
Temperature adjustment	19.8091	20.0092	20.2421	20.4625	20.5310	20.5457	20.5463	20.5472	20.5403	20.4365	20.1063
adjusted MIT	19.8091	20.0092	20.2421	20.4625	20.5310	20.5457	20.5463	20.5472	20.5403	20.4365	20.1063
8. Space heating requirement											
Utilisation	0.9860	0.9666	0.9199	0.7843	0.5866	0.3959	0.2754	0.3129	0.5326	0.8427	0.9657
Useful gains	539.5969	608.7393	639.2058	611.6876	491.5891	330.2063	219.3412	229.9514	357.5881	499.3510	522.1630
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000
Heat loss rate W	892.8210	867.1836	786.3944	652.4578	497.0068	330.5032	219.3595	229.9954	359.7122	553.5993	735.9123
Space heating kWh	262.7987	173.6746	109.5084	29.3546	4.0308	0.0000	0.0000	0.0000	0.0000	40.3607	153.8995
Space heating requirement - total per year (kWh/year)	262.7987	173.6746	109.5084	29.3546	4.0308	0.0000	0.0000	0.0000	0.0000	40.3607	153.8995
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Space heating kWh	262.7987	173.6746	109.5084	29.3546	4.0308	0.0000	0.0000	0.0000	0.0000	40.3607	153.8995
Space heating requirement after solar contribution - total per year (kWh/year)	262.7987	173.6746	109.5084	29.3546	4.0308	0.0000	0.0000	0.0000	0.0000	40.3607	153.8995
Space heating per m2										(98c) / (4) =	15.4089 (99)
9a. Energy requirements - Individual heating systems, including micro-CHP											
Fraction of space heat from secondary/supplementary system (Table 11)											0.0000 (201)
Fraction of space heat from main system(s)											1.0000 (202)
Fraction of main heating from main system 2											0.0000 (203)
Fraction of total heating from main system 1											1.0000 (204)
Fraction of total heating from main system 2											0.0000 (205)
Efficiency of main space heating system 1 (in %)											92.3000 (206)
Efficiency of main space heating system 2 (in %)											88.8000 (207)
Efficiency of secondary/supplementary heating system, %											0.0000 (208)
Space heating requirement	262.7987	173.6746	109.5084	29.3546	4.0308	0.0000	0.0000	0.0000	0.0000	40.3607	153.8995
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000
Space heating fuel (main heating system)	284.7223	188.1631	118.6439	31.8034	4.3670	0.0000	0.0000	0.0000	0.0000	43.7278	166.7384
Space heating efficiency (main heating system 2)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000
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
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
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water heating											
Water heating requirement	200.7743	177.2349	187.7258	163.9935	158.1900	141.7193	139.3888	145.4621	147.6302	165.5832	177.2053
Efficiency of water heater	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000
Fuel for water heating, kWh/month	251.5969	222.0988	235.2454	205.5057	198.2331	177.5931	174.6726	182.2833	185.0002	207.4978	222.0617
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Pumps and Fa	11.1260	10.0493	11.1260	10.7671	11.1260	10.7671	11.1260	11.1260	10.7671	11.1260	10.7671
Lighting	20.3207	16.3020	14.6781	10.7538	8.3066	6.7865	7.5775	9.8496	12.7936	16.7859	18.9596
Electricity generated by PVs (Appendix M) (negative quantity)	-8.2084	-12.7011	-20.0163	-24.7491	-28.7408	-27.6015	-27.2745	-24.7098	-20.5908	-15.4590	-9.4176
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity generated by PVs (Appendix M) (negative quantity)	-1.7482	-3.8300	-7.9072	-12.3247	-16.7468	-16.9884	-16.7819	-13.9943	-9.9859	-5.6120	-2.3760
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1135.2180	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2510.4943	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												131.0000	(231)
Electricity for lighting (calculated in Appendix L)												163.9995	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-336.1070	(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												3604.6048	(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	1135.2180	0.2100	238.3958	(261)
Space heating - main system 2	0.0000	0.2100	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2510.4943	0.2100	527.2038	(264)
Space and water heating			765.5996	(265)
Pumps, fans and electric keep-hot	131.0000	0.1387	18.1713	(267)
Energy for lighting	163.9995	0.1443	23.6702	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-226.4407	0.1327	-30.0456	
PV Unit electricity exported	-109.6664	0.1248	-13.6908	
Total			-43.7365	(269)
Total CO2, kg/year			763.7046	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.2300	(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	1135.2180	1.1300	1282.7964	(275)
Space heating - main system 2	0.0000	1.1300	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2510.4943	1.1300	2836.8586	(278)
Space and water heating			4119.6550	(279)
Pumps, fans and electric keep-hot	131.0000	1.5128	198.1768	(281)
Energy for lighting	163.9995	1.5338	251.5479	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-226.4407	1.4903	-337.4595	
PV Unit electricity exported	-109.6664	0.4582	-50.2491	
Total			-387.7086	(283)
Total Primary energy kWh/year			4181.6711	(286)
Target Primary Energy Rate (TPER)			61.5000	(287)

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Plot Reference	02flr sample 3 Plot 08			Issued on Date	13/12/2025
Assessment Reference	Block D 3B5P	Plot Type Ref	Block D 3B5P		
Plot Address				SAP Version	10.2
SAP Rating	88 B	DER	1.20	TER	10.75
Environmental	99 A	% DER < TER			88.84
CO ₂ Emissions (t/year)	0.09	DFEE	22.15	TFEE	24.06
Compliance Check	See BREL	% DFEE < TFEE			7.93
% DPER < TPER	78.58	DPER	12.55	TPER	58.59
Assessor Details	Mr. Andrew Jones			Assessor ID	N955-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	86.0000 (1b)	2.5000 (2b)	215.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	215.0000 (5)

2. Ventilation rate

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

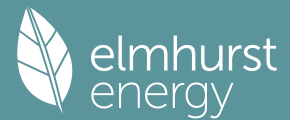
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												85.5000 (23c)
Effective ac	0.2351	0.2319	0.2287	0.2128	0.2096	0.1936	0.1936	0.1904	0.2000	0.2096	0.2159	0.2223 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows Open			15.7000	1.1450	17.9771		(27)
External Wall 1	47.5000	15.7000	31.8000	0.1500	4.7700	70.0000	2226.0000 (29a)
Total net area of external elements Aum(A, m ²)			47.5000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.7471		(33)
Main dwelling							
Party Wall hall			47.5000	0.0000	0.0000	180.0000	8550.0000 (32)
Party Floor 1			86.0000			40.0000	3440.0000 (32a)
Party Ceiling 1			86.0000			30.0000	2580.0000 (32b)
Internal Wall 1			224.0000			9.0000	2016.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	18812.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							218.7442 (35)
Thermal bridges (User defined value 0.075 * total exposed area)							3.5625 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	26.3096 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	16.6777	16.4515	16.2254	15.0946	14.8685	13.7377	13.7377	13.5115	14.1900	14.8685	15.3208	15.7731	(38)
Heat transfer coeff	42.9873	42.7611	42.5350	41.4042	41.1781	40.0473	40.0473	39.8211	40.4996	41.1781	41.6304	42.0827	(39)
Average = Sum(39)m / 12 =												41.3477	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.4999	0.4972	0.4946	0.4814	0.4788	0.4657	0.4657	0.4630	0.4709	0.4788	0.4841	0.4893	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5669 (42)
Hot water usage for mixer showers													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
77.5624	76.4105	74.7883	71.7974	69.5579	67.0745	65.7332	67.3440	69.0978	71.7551	74.8076	77.3002	77.3002	(42b)
Hot water usage for other uses													
40.9178	39.4299	37.9420	36.4541	34.9661	33.4782	33.4782	34.9661	36.4541	37.9420	39.4299	40.9178	40.9178	(42c)
Average daily hot water use (litres/day)												109.1106	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
118.4802	115.8404	112.7303	108.2515	104.5240	100.5528	99.2114	102.3101	105.5519	109.6970	114.2375	118.2180	118.2180	(44)
Energy conte	187.6437	164.9551	173.2623	148.1909	140.7094	123.6413	119.9876	126.6813	130.1560	148.8578	162.7522	185.1008	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
28.1466	24.7433	25.9893	22.2286	21.1064	18.5462	17.9981	19.0022	19.5234	22.3287	24.4128	27.7651	27.7651	(46)
Water storage loss (or HIU loss):													
Store volume												15.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2500	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.1500	(55)
Total storage loss													
4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.5000	4.6500	4.5000	4.6500	(56)
If cylinder contains dedicated solar storage													
4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
215.5561	190.1663	201.1747	175.2029	168.6218	150.6533	147.9000	154.5937	157.1680	176.7702	189.7642	213.0132	213.0132	(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	215.5561	190.1663	201.1747	175.2029	168.6218	150.6533	147.9000	154.5937	157.1680	176.7702	189.7642	213.0132	(64)
12Total per year (kWh/year)												2140.5844	(64)
Electric shower(s)												2141	(64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
84.7214	75.0165	79.9396	70.8831	69.1158	62.7203	62.2258	64.4514	64.8865	71.8251	75.7247	83.8759	83.8759	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
122.3739	135.4854	122.3739	126.4530	122.3739	126.4530	122.3739	122.3739	122.3739	126.4530	122.3739	126.4530	122.3739	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
231.5234	233.9259	227.8717	214.9831	198.7134	183.4223	173.2069	170.8044	176.8586	189.7472	206.0168	221.3080	221.3080	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	(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)													
-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	(71)
Water heating gains (Table 5)													
113.8729	111.6318	107.4457	98.4487	92.8976	87.1116	83.6368	86.6283	90.1201	96.5392	105.1732	112.7365	112.7365	(72)
Total internal gains													
529.2740	542.5469	519.1952	501.3886	475.4887	458.4907	440.7214	441.3103	454.9355	470.1641	499.1469	517.9222	517.9222	(73)

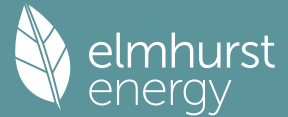
6. Solar gains

[Jan]													
	Area	Solar flux	g	FF	Access	Gains							
	m2	Table 6a	Specific data	Specific data	factor	W							
		W/m2	or Table 6b	or Table 6c	Table 6d								
Northeast	5.1300	11.2829	0.4000	0.6000	0.7700	9.6268	(75)						
Northwest	10.5700	11.2829	0.4000	0.6000	0.7700	19.8354	(81)						
Solar gains	29.4623	59.9713	108.0493	177.4480	238.5249	254.2927	237.8857	189.6452	131.6597	73.2897	37.0712	24.0604	(83)
Total gains	558.7363	602.5182	627.2444	678.8365	714.0136	712.7834	678.6070	630.9555	586.5952	543.4538	536.2181	541.9825	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
121.5605	122.2034	122.8531	126.2083	126.9015	130.4846	130.4846	131.2257	129.0273	126.9015	125.5227	124.1736	124.1736	
alpha	9.1040	9.1469	9.1902	9.4139	9.4601	9.6990	9.6990	9.7484	9.6018	9.4601	9.3682	9.2782	
util living area													

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	0.9754	0.9503	0.8941	0.7265	0.5357	0.3596	0.2597	0.2903	0.4762	0.7689	0.9342	0.9788 (86)
MIT	20.7247	20.8153	20.9108	20.9874	20.9992	21.0000	21.0000	21.0000	20.9998	20.9834	20.8758	20.7182 (87)
Th 2	20.5210	20.5234	20.5258	20.5379	20.5403	20.5524	20.5524	20.5548	20.5476	20.5403	20.5355	20.5306 (88)
util rest of house												
	0.9704	0.9412	0.8778	0.7014	0.5094	0.3344	0.2332	0.2622	0.4450	0.7398	0.9215	0.9744 (89)
MIT 2	20.2740	20.3625	20.4524	20.5287	20.5398	20.5524	20.5524	20.5548	20.5475	20.5286	20.4312	20.2766 (90)
Living area fraction									FLA = Living area / (4) =			0.2093 (91)
MIT	20.3683	20.4573	20.5484	20.6247	20.6360	20.6461	20.6461	20.6480	20.6421	20.6238	20.5243	20.3691 (92)
Temperature adjustment												0.0000
adjusted MIT	20.3683	20.4573	20.5484	20.6247	20.6360	20.6461	20.6461	20.6480	20.6421	20.6238	20.5243	20.3691 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9686	0.9399	0.8786	0.7062	0.5149	0.3397	0.2388	0.2681	0.4516	0.7452	0.9211	0.9727	(94)
Useful gains	541.1916	566.2962	551.0930	479.3808	367.6281	242.1246	162.0347	169.1601	264.8834	404.9658	493.9292	527.1963	(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	690.7333	665.2474	597.5474	485.4539	367.9654	242.1291	162.0348	169.1604	264.9539	412.7606	558.8570	680.4369	(97)
Space heating kWh	111.2590	66.4952	34.5621	4.3726	0.2510	0.0000	0.0000	0.0000	0.0000	5.7993	46.7480	114.0110	(98a)
Space heating requirement - total per year (kWh/year)												383.4982	
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	111.2590	66.4952	34.5621	4.3726	0.2510	0.0000	0.0000	0.0000	0.0000	5.7993	46.7480	114.0110	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												383.4982	
Space heating per m2										(98c) / (4) =		4.4593	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)
Fraction of space heat from community system												1.0000 (302)
Fraction of heat from community Heat pump-Space												1.0000 (303a)
Fraction of heat from community Heat pump-Water												1.0000 (303b)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500 (305)
Distribution loss factor (Table 12c) for community heating system												1.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	111.2590	66.4952	34.5621	4.3726	0.2510	0.0000	0.0000	0.0000	0.0000	5.7993	46.7480	114.0110 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00												
307a	116.8220	69.8200	36.2902	4.5912	0.2636	0.0000	0.0000	0.0000	0.0000	6.0893	49.0854	119.7115
Space heating requirement	116.8220	69.8200	36.2902	4.5912	0.2636	0.0000	0.0000	0.0000	0.0000	6.0893	49.0854	119.7115 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement	215.5561	190.1663	201.1747	175.2029	168.6218	150.6533	147.9000	154.5937	157.1680	176.7702	189.7642	213.0132 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00												
310b	215.5561	190.1663	201.1747	175.2029	168.6218	150.6533	147.9000	154.5937	157.1680	176.7702	189.7642	213.0132
Water heating fuel	215.5561	190.1663	201.1747	175.2029	168.6218	150.6533	147.9000	154.5937	157.1680	176.7702	189.7642	213.0132 (310)
Cooling System Energy Efficiency Ratio	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	14.7589	13.3306	14.7589	14.2828	14.7589	14.2828	14.7589	14.7589	14.2828	14.7589	14.2828	14.7589 (311)
Lighting	27.1569	21.7863	19.6161	14.3716	11.1011	9.0697	10.1268	13.1631	17.0976	22.4330	25.3380	27.9117 (332)
Electricity generated by PVs (Appendix M) (negative quantity)	-12.1031	-18.6462	-29.3211	-36.1680	-41.8851	-40.1862	-39.6777	-35.9698	-30.0064	-22.6206	-13.8497	-10.2850 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												402.6731 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2140.5844 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution (space)												4.0267 (313)
Electricity used for heat distribution (water)												2.1301 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6625)												
mechanical ventilation fans (SFP = 0.6625)												173.7738 (330a)
Total electricity for the above, kWh/year												173.7738 (331)
Electricity for lighting (calculated in Appendix L)												219.1720 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-330.7189 (333)
Wind generation												0.0000 (334)
Hydro-electric generation (Appendix N)												0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (335)
Appendix Q - special features												
Energy saved or generated												-0.0000 (336)
Energy used												0.0000 (337)
Total delivered energy for all uses												2605.4843 (338)

12b. Carbon dioxide emissions - Community heating scheme

Energy	Emission factor	Emissions
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	kWh/year	kg CO2/kWh	kg CO2/year
Efficiency of heat source Heat pump			330.0000 (367)
Space heating from Heat pump	122.0221	0.1595	19.4576 (367)
Efficiency of heat source Heat pump			440.0000 (367)
Water heating from Heat pump	486.4965	0.0000	0.0000 (368)
Electrical energy for heat distribution (space & water)	4.0267	0.0000	3.6626 (372)
Overall CO2 factor for heat network (space)			0.0499 (386)
Overall CO2 factor for heat network (water)			0.0335 (386)
Total CO2 associated with community systems			91.7690 (373)
Space and water heating			91.7690 (376)
Pumps, fans and electric keep-hot	173.7738	0.1387	24.1046 (378)
Energy for lighting	219.1720	0.1443	31.6333 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-330.7189	0.1328	-43.9033
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-43.9033 (380)
Total CO2, kg/year			103.6035 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.2000 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			330.0000 (467a)
Space heating from Heat pump	122.0221	1.5902	194.0431 (467)
Efficiency of heat source Heat pump			440.0000 (467b)
Water heating from Heat pump	486.4965	0.0000	0.0000 (468)
Electrical energy for heat distribution (space & water)	4.0267	0.0000	38.9784 (472)
Overall CO2 factor for heat network (space)			0.4978 (486)
Overall CO2 factor for heat network (water)			0.3611 (486)
Total CO2 associated with community systems			973.3611 (473)
Space and water heating			973.3611 (476)
Pumps, fans and electric keep-hot	173.7738	1.5128	262.8849 (478)
Energy for lighting	219.1720	1.5338	336.1733 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-330.7189	1.4905	-492.9430
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-492.9430 (480)
Total Primary energy kWh/year			1079.4763 (483)
Dwelling Primary energy Rate (DPER)			12.5500 (484)

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

1. Overall dwelling characteristics

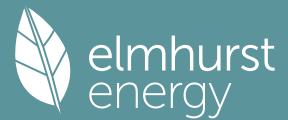
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	86.0000	2.5000	215.0000
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.0000		
Dwelling volume			

2. Ventilation rate

		m3 per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1395 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3895 (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) =	0.3311 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000	(22)
Wind factor	1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 0.9500 0.9250 1.0000 1.0750 1.1250 1.1750	(22a)
Adj infilt rate	0.4222 0.4139 0.4056 0.3642 0.3559 0.3145 0.3145 0.3063 0.3311 0.3559 0.3725 0.3890	(22b)
Effective ac	0.5891 0.5856 0.5823 0.5663 0.5633 0.5495 0.5495 0.5469 0.5548 0.5633 0.5694 0.5757	(25)

3. Heat losses and heat loss parameter

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Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
TER Opening Type			15.7000	1.1450	17.9771		(27)
External Wall 1	47.5000	15.7000	31.8000	0.1800	5.7240		(29a)
Total net area of external elements Aum(A, m ²)			47.5000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.7011		(33)
Main dwelling							
Party Wall hall			47.5000	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 218.7442 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	38.0000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	38.0000	0.0700	2.6600
E1 Steel lintel with perforated steel base plate	8.4000	0.0500	0.4200
E3 Sill	8.4000	0.0500	0.4200
E4 Jamb	21.9800	0.0500	1.0990
E16 Corner (normal)	2.5000	0.0900	0.2250
E18 Party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.1240 (36)

Point Thermal bridges

Total fabric heat loss (33) + (36) + (36a) = 28.8251 (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	41.7973	41.5518	41.3111	40.1809	39.9694	38.9849	38.9849	38.8026	39.3641	39.9694	40.3972	40.8444
Heat transfer coeff	70.6224	70.3769	70.1362	69.0060	68.7945	67.8100	67.8100	67.6277	68.1892	68.7945	69.2223	69.6695
Average = Sum(39)m / 12 =												69.0049

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8212	0.8183	0.8155	0.8024	0.7999	0.7885	0.7885	0.7864	0.7929	0.7999	0.8049	0.8101
HLP (average)												0.8024
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5669
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												
77.5624	76.4105	74.7883	71.7974	69.5579	67.0745	65.7332	67.3440	69.0978	71.7551	74.8076	77.3002	(42b)
Hot water usage for other uses												
40.9178	39.4299	37.9420	36.4541	34.9661	33.4782	33.4782	34.9661	36.4541	37.9420	39.4299	40.9178	(42c)
Average daily hot water use (litres/day)												109.1106

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	118.4802	115.8404	112.7303	108.2515	104.5240	100.5528	99.2114	102.3101	105.5519	109.6970	114.2375	118.2180
Energy conte	187.6437	164.9551	173.2623	148.1909	140.7094	123.6413	119.9876	126.6813	130.1560	148.8578	162.7522	185.1008
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m	28.1466	24.7433	25.9893	22.2286	21.1064	18.5462	17.9981	19.0022	19.5234	22.3287	24.4128	27.7651

Water storage loss (or HIU loss): 15.0000 (47)

Store volume 0.4337 (48)

a) If manufacturer declared loss factor is known (kWh/day): 0.5400 (49)

Temperature factor from Table 2b 0.2342 (55)

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

Total storage loss 7.2595 6.5570 7.2595 7.0253 7.2595 7.0253 7.2595 7.2595 7.0253 7.2595 7.0253 7.2595 (56)

If cylinder contains dedicated solar storage 7.2595 6.5570 7.2595 7.0253 7.2595 7.0253 7.2595 7.2595 7.0253 7.2595 7.0253 7.2595 (57)

Primary loss 23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 22.5120 23.2624 22.5120 23.2624 22.5120 (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 218.1656 192.5233 203.7842 177.7282 171.2313 153.1787 150.5095 157.2032 159.6934 179.3798 192.2895 215.6227 (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 218.1656 192.5233 203.7842 177.7282 171.2313 153.1787 150.5095 157.2032 159.6934 179.3798 192.2895 215.6227 (64)

Total per year (kWh/year) = Sum(64)m = 2171.3095 (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)

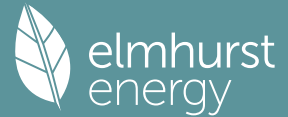
Heat gains from water heating, kWh/month 86.8091 76.9021 82.0273 72.9033 71.2034 64.7406 64.3134 66.5391 66.9068 73.9128 77.7450 85.9636 (65)

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	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.0075	131.7583	119.0075	122.9744	119.0075	122.9744	119.0075	119.0075	122.9744	119.0075	122.9744	119.0075
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	231.5234	233.9259	227.8717	214.9831	198.7134	183.4223	173.2069	170.8044	176.8586	189.7472	206.0168	221.3080
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000
Losses e.g. evaporation (negative values) (Table 5)	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768
Water heating gains (Table 5)	116.6789	114.4377	110.2517	101.2546	95.7035	89.9175	86.4428	89.4342	92.9260	99.3451	107.9791	115.5424
Total internal gains	531.7136	544.6257	521.6347	503.7159	477.9282	457.8180	440.1609	440.7499	454.2628	472.6036	501.4742	520.3617

6. Solar gains

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[Jan]	Area m2				Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W	
Northeast	5.1300				11.2829	0.6300		0.7000		0.7700	17.6893	(75)
Northwest	10.5700				11.2829	0.6300		0.7000		0.7700	36.4476	(81)
Solar gains	54.1370	110.1973	198.5405	326.0606	438.2894	467.2629	437.1149	348.4731	241.9248	134.6699	68.1183	44.2110 (83)
Total gains	585.8505	654.8230	720.1752	829.7765	916.2177	925.0810	877.2758	789.2229	696.1876	607.2735	569.5925	564.5727 (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	73.9929	74.2510	74.5058	75.7262	75.9589	77.0617	77.0617	77.2694	76.6331	75.9589	75.4895	75.0049
alpha	5.9329	5.9501	5.9671	6.0484	6.0639	6.1374	6.1374	6.1513	6.1089	6.0639	6.0326	6.0003
util living area	0.9920	0.9835	0.9591	0.8608	0.6724	0.4667	0.3398	0.3934	0.6545	0.9184	0.9823	0.9934 (86)
MIT	20.1136	20.2749	20.5160	20.8204	20.9646	20.9967	20.9996	20.9991	20.9779	20.7652	20.4013	20.0946 (87)
Th 2	20.2350	20.2375	20.2399	20.2513	20.2534	20.2633	20.2633	20.2652	20.2595	20.2534	20.2491	20.2446 (88)
util rest of house	0.9899	0.9793	0.9488	0.8322	0.6258	0.4140	0.2831	0.3310	0.5921	0.8938	0.9770	0.9917 (89)
MIT 2	19.1980	19.4039	19.7062	20.0742	20.2247	20.2614	20.2632	20.2648	20.2445	20.0217	19.5742	19.1813 (90)
Living area fraction	19.3897	19.5862	19.8757	20.2304	20.3796	20.4153	20.4173	20.4185	20.3980	20.1773	19.7473	19.3725 (91)
MIT	19.3897	19.5862	19.8757	20.2304	20.3796	20.4153	20.4173	20.4185	20.3980	20.1773	19.7473	19.3725 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3897	19.5862	19.8757	20.2304	20.3796	20.4153	20.4173	20.4185	20.3980	20.1773	19.7473	19.3725 (93)
8. Space heating requirement												
Utilisation	0.9869	0.9747	0.9430	0.8314	0.6339	0.4250	0.2949	0.3440	0.6041	0.8909	0.9725	0.9891 (94)
Useful gains	578.1487	638.2527	679.1236	689.8595	580.8118	393.1237	258.7501	271.5077	420.5691	541.0362	553.9478	558.3915 (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	1065.6682	1033.5693	938.1229	781.8660	597.1069	394.3337	258.8520	271.7606	429.4575	658.8653	875.4764	1057.0579 (97)
Space heating kWh	362.7145	265.6528	192.6955	66.2447	12.1236	0.0000	0.0000	0.0000	0.0000	87.6648	231.5006	371.0078 (98a)
Space heating requirement - total per year (kWh/year)												1589.6042
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	362.7145	265.6528	192.6955	66.2447	12.1236	0.0000	0.0000	0.0000	0.0000	87.6648	231.5006	371.0078 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1589.6042
Space heating per m2										(98c) / (4) =		18.4838 (99)
9a. Energy requirements - Individual heating systems, including micro-CHP												
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Fraction of main heating from main system 2												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												88.8000 (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	362.7145	265.6528	192.6955	66.2447	12.1236	0.0000	0.0000	0.0000	0.0000	87.6648	231.5006	371.0078 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	392.9735	287.8145	208.7709	71.7710	13.1350	0.0000	0.0000	0.0000	0.0000	94.9781	250.8132	401.9586 (211)
Space heating efficiency (main heating system 2)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Space heating fuel used, main system 2												0.0000 (213)
Water heating												
Water heating requirement	218.1656	192.5233	203.7842	177.7282	171.2313	153.1787	150.5095	157.2032	159.6934	179.3798	192.2895	215.6227 (64)
Efficiency of water heater (217)m	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000 (216)
Fuel for water heating, kWh/month	273.3905	241.2573	255.3687	222.7171	214.5756	191.9532	188.6084	196.9965	200.1170	224.7867	240.9643	270.2039 (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	11.1260	10.0493	11.1260	10.7671	11.1260	10.7671	11.1260	11.1260	10.7671	11.1260	10.7671	11.1260 (231)
Lighting	24.7274	19.8372	17.8612	13.0859	10.1079	8.2583	9.2208	11.9855	15.5680	20.4261	23.0712	25.4147 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-10.3137	-15.9204	-25.0279	-30.8626	-35.7587	-34.3037	-33.8901	-30.7392	-25.6714	-19.3381	-11.8181	-8.7636 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-2.2784	-4.9866	-10.2871	-16.0248	-21.7697	-22.0894	-21.8283	-18.2101	-12.9993	-7.3106	-3.0974	-1.7876 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												

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(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1722.2147	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2720.9392	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												131.0000	(231)
Electricity for lighting (calculated in Appendix L)												199.5644	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-425.0765	(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												4348.6418	(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	1722.2147	0.2100	361.6651	(261)
Space heating - main system 2	0.0000	0.2100	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2720.9392	0.2100	571.3972	(264)
Space and water heating			933.0623	(265)
Pumps, fans and electric keep-hot	131.0000	0.1387	18.1713	(267)
Energy for lighting	199.5644	0.1443	28.8033	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-282.4074	0.1327	-37.4871	
PV Unit electricity exported	-142.6692	0.1248	-17.8120	
Total			-55.2990	(269)
Total CO2, kg/year			924.7379	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.7500	(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	1722.2147	1.1300	1946.1027	(275)
Space heating - main system 2	0.0000	1.1300	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2720.9392	1.1300	3074.6613	(278)
Space and water heating			5020.7640	(279)
Pumps, fans and electric keep-hot	131.0000	1.5128	198.1768	(281)
Energy for lighting	199.5644	1.5338	306.0985	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-282.4074	1.4905	-420.9232	
PV Unit electricity exported	-142.6692	0.4582	-65.3747	
Total			-486.2980	(283)
Total Primary energy kWh/year			5038.7413	(286)
Target Primary Energy Rate (TPER)			58.5900	(287)

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Plot Reference	02flr sample 4 Plot 09				Issued on Date	13/12/2025	
Assessment Reference	Block E 2B4P			Plot Type Ref	Block E 2B4P		
Plot Address					SAP Version	10.2	
SAP Rating	88 B		DER	1.21		TER	11.07
Environmental	99 A		% DER < TER				89.07
CO ₂ Emissions (t/year)	0.08		DFEE	20.98		TFEE	22.05
Compliance Check	See BREL		% DFEE < TFEE				4.84
% DPER < TPER	79.07		DPER	12.68		TPER	60.56
Assessor Details	Mr. Andrew Jones				Assessor ID	N955-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	72.0000 (1b)	2.5000 (2b)	180.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	180.0000 (5)

2. Ventilation rate

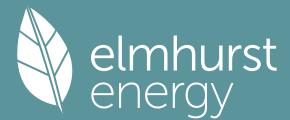
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												86.4000 (23c)
Effective ac	0.2306	0.2274	0.2242	0.2082	0.2051	0.1891	0.1891	0.1859	0.1955	0.2051	0.2114	0.2178 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows Open			13.6400	1.1450	15.6183		(27)
External Wall 1	42.5000	13.6400	28.8600	0.1500	4.3290	70.0000	2020.2000 (29a)
Total net area of external elements Aum(A, m ²)			42.5000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.9473		(33)
Main dwelling							
Party Wall hall			42.5000	0.0000	0.0000	180.0000	7650.0000 (32)
Party Floor 1			72.0000			40.0000	2880.0000 (32a)
Party Ceiling 1			72.0000			30.0000	2160.0000 (32b)
Internal Wall 1			144.2000			9.0000	1297.8000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	16008.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							222.3333 (35)
Thermal bridges (User defined value 0.075 * total exposed area)							3.1875 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	23.1348 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	13.6954	13.5061	13.3167	12.3700	12.1807	11.2340	11.2340	11.0447	11.6127	12.1807	12.5594	12.9381	(38)
Heat transfer coeff	36.8302	36.6409	36.4516	35.5049	35.3155	34.3688	34.3688	34.1795	34.7475	35.3155	35.6942	36.0729	(39)
Average = Sum(39)m / 12 =												35.4575	
HLP	0.5115	0.5089	0.5063	0.4931	0.4905	0.4773	0.4773	0.4747	0.4826	0.4905	0.4958	0.5010	(40)
HLP (average)												0.4925	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2937 (42)
Hot water usage for mixer showers													(42a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Hot water usage for baths													(42b)
72.2582	71.1851	69.6739	66.8875	64.8011	62.4876	61.2380	62.7386	64.3725	66.8480	69.6918	72.0139	72.0139	
Hot water usage for other uses													(42c)
38.1196	36.7335	35.3473	33.9611	32.5749	31.1888	31.1888	32.5749	33.9611	35.3473	36.7335	38.1196	38.1196	
Average daily hot water use (litres/day)												101.6490	(43)
Daily hot water use													
110.3779	107.9185	105.0212	100.8486	97.3760	93.6764	92.4267	95.3135	98.3336	102.1953	106.4252	110.1336	110.1336	(44)
Energy conte	174.8115	153.6746	161.4136	138.0567	131.0869	115.1860	111.7821	118.0181	121.2552	138.6781	151.6223	172.4426	(45)
Energy content (annual)												1688.0277	
Distribution loss (46)m = 0.15 x (45)m													
26.2217	23.0512	24.2120	20.7085	19.6630	17.2779	16.7673	17.7027	18.1883	20.8017	22.7433	25.8664	25.8664	(46)
Water storage loss (or HIU loss):													
Store volume												15.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2500	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.1500	(55)
Total storage loss													
4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	(56)
If cylinder contains dedicated solar storage													
4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
202.7239	178.8858	189.3260	165.0687	158.9993	142.1980	139.6945	145.9305	148.2672	166.5905	178.6343	200.3550	200.3550	(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													
202.7239	178.8858	189.3260	165.0687	158.9993	142.1980	139.6945	145.9305	148.2672	166.5905	178.6343	200.3550	200.3550	(64)
12Total per year (kWh/year)												2016.6737	(64)
Electric shower(s)												2017	(64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
80.4548	71.2658	76.0000	67.5135	65.9163	59.9090	59.4975	61.5709	61.9270	68.4404	72.0240	79.6671	79.6671	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
105.9464	117.2978	105.9464	109.4780	105.9464	109.4780	105.9464	105.9464	109.4780	105.9464	109.4780	105.9464	105.9464	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
201.9192	204.0145	198.7344	187.4938	173.3045	159.9686	151.0594	148.9641	154.2442	165.4848	179.6741	193.0100	193.0100	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	(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)													
-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	(71)
Water heating gains (Table 5)													
108.1381	106.0502	102.1505	93.7687	88.5972	83.2069	79.9697	82.7566	86.0097	91.9898	100.0333	107.0794	107.0794	(72)
Total internal gains													
473.4090	484.7678	464.2366	448.1457	425.2534	410.0587	394.3808	395.0724	407.1370	420.8262	446.5906	463.4410	463.4410	(73)

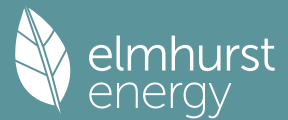
6. Solar gains

[Jan]			Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d	Gains W		
Southwest			6.0800	36.7938		0.4000	0.6000		0.7700	37.2069 (79)		
Northwest			7.5600	11.2829		0.4000	0.6000		0.7700	14.1869 (81)		
Solar gains	51.3938	92.2550	138.7441	192.8907	235.2032	241.9256	229.7368	196.8819	157.2922	105.3363	62.4161	43.4271 (83)
Total gains	524.8028	577.0228	602.9806	641.0364	660.4566	651.9844	624.1176	591.9543	564.4293	526.1625	509.0067	506.8681 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	120.7341	121.3580	121.9884	125.2410	125.9125	129.3807	129.3807	130.0974	127.9708	125.9125	124.5767	123.2690	
alpha	9.0489	9.0905	9.1326	9.3494	9.3942	9.6254	9.6254	9.6732	9.5314	9.3942	9.3051	9.2179	
util living area													

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	0.9562	0.9106	0.8325	0.6649	0.4969	0.3374	0.2423	0.2656	0.4247	0.6907	0.8910	0.9624 (86)
MIT	20.7882	20.8793	20.9502	20.9936	20.9996	21.0000	21.0000	21.0000	20.9999	20.9927	20.9200	20.7784 (87)
Th 2	20.5103	20.5127	20.5151	20.5271	20.5296	20.5416	20.5416	20.5441	20.5368	20.5296	20.5247	20.5199 (88)
util rest of house												
	0.9481	0.8970	0.8122	0.6402	0.4719	0.3132	0.2171	0.2393	0.3962	0.6615	0.8735	0.9553 (89)
MIT 2	20.3243	20.4107	20.4756	20.5226	20.5293	20.5416	20.5416	20.5441	20.5368	20.5246	20.4599	20.3241 (90)
Living area fraction												
MIT	20.4919	20.5799	20.6470	20.6927	20.6991	20.7072	20.7072	20.7087	20.7040	20.6937	20.6260	20.4882 (91)
Temperature adjustment												
adjusted MIT	20.4919	20.5799	20.6470	20.6927	20.6991	20.7072	20.7072	20.7087	20.7040	20.6937	20.6260	20.4882 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9478	0.8989	0.8179	0.6489	0.4809	0.3219	0.2262	0.2488	0.4065	0.6717	0.8774	0.9548	(94)
Useful gains	497.4127	518.7049	493.1673	415.9564	317.6373	209.8933	141.1583	147.2693	229.4477	353.4455	446.6094	483.9726	(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	596.3497	574.5267	515.6793	418.6972	317.8083	209.8959	141.1584	147.2695	229.4733	356.4628	482.8012	587.5607	(97)
Space heating kWh	73.6092	37.5123	16.7489	1.9734	0.1272	0.0000	0.0000	0.0000	0.0000	2.2449	26.0581	77.0696	(98a)
Space heating requirement - total per year (kWh/year)												235.3436	
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	73.6092	37.5123	16.7489	1.9734	0.1272	0.0000	0.0000	0.0000	0.0000	2.2449	26.0581	77.0696	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												235.3436	
Space heating per m2											(98c) / (4) =	3.2687	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)
Fraction of space heat from community system												1.0000 (302)
Fraction of heat from community Heat pump-Space												1.0000 (303a)
Fraction of heat from community Heat pump-Water												1.0000 (303b)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500 (305)
Distribution loss factor (Table 12c) for community heating system												1.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	73.6092	37.5123	16.7489	1.9734	0.1272	0.0000	0.0000	0.0000	0.0000	2.2449	26.0581	77.0696 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00												
307a	77.2896	39.3879	17.5864	2.0720	0.1336	0.0000	0.0000	0.0000	0.0000	2.3571	27.3610	80.9230
Space heating requirement	77.2896	39.3879	17.5864	2.0720	0.1336	0.0000	0.0000	0.0000	0.0000	2.3571	27.3610	80.9230 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement	202.7239	178.8858	189.3260	165.0687	158.9993	142.1980	139.6945	145.9305	148.2672	166.5905	178.6343	200.3550 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00												
310b	202.7239	178.8858	189.3260	165.0687	158.9993	142.1980	139.6945	145.9305	148.2672	166.5905	178.6343	200.3550
Water heating fuel	202.7239	178.8858	189.3260	165.0687	158.9993	142.1980	139.6945	145.9305	148.2672	166.5905	178.6343	200.3550 (310)
Cooling System Energy Efficiency Ratio	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	13.9882	12.6345	13.9882	13.5370	13.9882	13.5370	13.9882	13.9882	13.5370	13.9882	13.5370	13.9882 (331)
Lighting	23.5114	18.8617	16.9829	12.4424	9.6108	7.8521	8.7673	11.3961	14.8024	19.4216	21.9366	24.1648 (332)
Electricity generated by PVs (Appendix M) (negative quantity)	-11.9281	-18.2781	-28.5911	-35.0786	-40.4601	-38.7671	-38.2840	-34.7891	-29.1363	-22.1038	-13.6182	-10.1471 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												247.1108 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2016.6737 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution (space)												2.4711 (313)
Electricity used for heat distribution (water)												2.0035 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)												
mechanical ventilation fans (SFP = 0.7500)												164.7000 (330a)
Total electricity for the above, kWh/year												164.7000 (331)
Electricity for lighting (calculated in Appendix L)												189.7503 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-321.1816 (333)
Wind generation												0.0000 (334)
Hydro-electric generation (Appendix N)												0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (335)
Appendix Q - special features												
Energy saved or generated												-0.0000 (336)
Energy used												0.0000 (337)
Total delivered energy for all uses												2297.0532 (338)

12b. Carbon dioxide emissions - Community heating scheme

Energy Emission factor Emissions

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	kWh/year	kg CO2/kWh	kg CO2/year
Efficiency of heat source Heat pump			330.0000 (367)
Space heating from Heat pump	74.8820	0.1600	11.9841 (367)
Efficiency of heat source Heat pump			440.0000 (367)
Water heating from Heat pump	458.3349	0.0000	0.0000 (368)
Electrical energy for heat distribution (space & water)	2.4711	0.0000	3.2406 (372)
Overall CO2 factor for heat network (space)			0.0501 (386)
Overall CO2 factor for heat network (water)			0.0335 (386)
Total CO2 associated with community systems			79.8874 (373)
Space and water heating			79.8874 (376)
Pumps, fans and electric keep-hot	164.7000	0.1387	22.8459 (378)
Energy for lighting	189.7503	0.1443	27.3868 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-321.1816	0.1329	-42.6692
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-42.6692 (380)
Total CO2, kg/year			87.4510 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.2100 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			330.0000 (467a)
Space heating from Heat pump	74.8820	1.5923	119.2368 (467)
Efficiency of heat source Heat pump			440.0000 (467b)
Water heating from Heat pump	458.3349	0.0000	0.0000 (468)
Electrical energy for heat distribution (space & water)	2.4711	0.0000	34.6221 (472)
Overall CO2 factor for heat network (space)			0.4984 (486)
Overall CO2 factor for heat network (water)			0.3611 (486)
Total CO2 associated with community systems			851.2971 (473)
Space and water heating			851.2971 (476)
Pumps, fans and electric keep-hot	164.7000	1.5128	249.1582 (478)
Energy for lighting	189.7503	1.5338	291.0453 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-321.1816	1.4909	-478.8476
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-478.8476 (480)
Total Primary energy kWh/year			912.6530 (483)
Dwelling Primary energy Rate (DPER)			12.6800 (484)

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

1. Overall dwelling characteristics

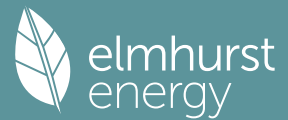
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	72.0000 (1b)	x 2.5000 (2b)	= 180.0000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 180.0000 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 30.0000 / (5) = 0.1667 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4167 (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) = 0.3542 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000 (22)
Wind factor	1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 0.9500 0.9250 1.0000 1.0750 1.1250 1.1750 (22a)
Adj infilt rate	0.4516 0.4427 0.4339 0.3896 0.3807 0.3365 0.3365 0.3276 0.3542 0.3807 0.3984 0.4161 (22b)
Effective ac	0.6020 0.5980 0.5941 0.5759 0.5725 0.5566 0.5566 0.5537 0.5627 0.5725 0.5794 0.5866 (25)

3. Heat losses and heat loss parameter

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Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K					
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K					
TER Opening Type			13.6400	1.1450	15.6183		(27)					
External Wall 1	42.5000	13.6400	28.8600	0.1800	5.1948		(29a)					
Total net area of external elements Aum(A, m2)			42.5000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.8131		(33)					
Main dwelling												
Party Wall hall			42.5000	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							222.3333 (35)					
List of Thermal Bridges												
K1 Element				Length	Psi-value	Total						
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				34.0000	0.0000	0.0000						
E7 Party floor between dwellings (in blocks of flats)				34.0000	0.0700	2.3800						
E16 Corner (normal)				2.5000	0.0900	0.2250						
E1 Steel lintel with perforated steel base plate				6.3200	0.0500	0.3160						
E3 Sill				6.3200	0.0500	0.3160						
E4 Jamb				17.2000	0.0500	0.8600						
E18 Party wall between dwellings				5.0000	0.0600	0.3000						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.3970 (36)					
Point Thermal bridges						(36a) =	0.0000					
Total fabric heat loss						(33) + (36) + (36a) =	25.2101 (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	35.7561	35.5209	35.2904	34.2077	34.0052	33.0622	33.0622	32.8875	33.4254	34.0052	34.4149	34.8434 (38)
Heat transfer coeff	60.9662	60.7310	60.5005	59.4178	59.2153	58.2723	58.2723	58.0977	58.6355	59.2153	59.6251	60.0535 (39)
Average = Sum(39)m / 12 =												59.4169
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8468	0.8435	0.8403	0.8252	0.8224	0.8093	0.8093	0.8069	0.8144	0.8224	0.8281	0.8341 (40)
HLP (average)												0.8252
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

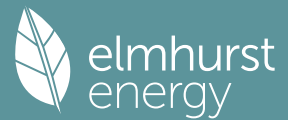
Assumed occupancy													2.2937 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	72.2582	71.1851	69.6739	66.8875	64.8011	62.4876	61.2380	62.7386	64.3725	66.8480	69.6918	72.0139	(42b)
Hot water usage for other uses	38.1196	36.7335	35.3473	33.9611	32.5749	31.1888	31.1888	32.5749	33.9611	35.3473	36.7335	38.1196	(42c)
Average daily hot water use (litres/day)													101.6490 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	110.3779	107.9185	105.0212	100.8486	97.3760	93.6764	92.4267	95.3135	98.3336	102.1953	106.4252	110.1336	(44)
Energy content (annual)	174.8115	153.6746	161.4136	138.0567	131.0869	115.1860	111.7821	118.0181	121.2552	138.6781	151.6223	172.4426	(45)
Distribution loss (46)m = 0.15 x (45)m	26.2217	23.0512	24.2120	20.7085	19.6630	17.2779	16.7673	17.7027	18.1883	20.8017	22.7433	25.8664	(46)
Water storage loss (or HIU loss):													
Store volume													15.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													0.4337 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.2342 (55)
Total storage loss	7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595	(56)
If cylinder contains dedicated solar storage	7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	205.3335	181.2428	191.9356	167.5941	161.6088	144.7234	142.3041	148.5400	150.7925	169.2000	181.1596	202.9645	(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													
	205.3335	181.2428	191.9356	167.5941	161.6088	144.7234	142.3041	148.5400	150.7925	169.2000	181.1596	202.9645	(64)
12Total per year (kWh/year)													2047.3988 (64)
Electric shower(s)													2047 (64)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
													0.0000 (64a)
Heat gains from water heating, kWh/month													
	82.5424	73.1513	78.0876	69.5337	68.0039	61.9292	61.5851	63.6586	63.9472	70.5280	74.0443	81.7547	(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	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	103.2351	114.2960	103.2351	106.6763	103.2351	106.6763	103.2351	103.2351	106.6763	103.2351	106.6763	103.2351 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.9192	204.0145	198.7344	187.4938	173.3045	159.9686	151.0594	148.9641	154.2442	165.4848	179.6741	193.0100 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684 (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)	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474 (71)
Water heating gains (Table 5)	110.9441	108.8562	104.9564	96.5746	91.4031	86.0128	82.7757	85.5626	88.8156	94.7957	102.8393	109.8853 (72)
Total internal gains	476.5036	487.5719	467.3312	451.1500	428.3480	410.0630	394.4754	395.1671	407.1413	423.9209	449.5949	466.5357 (73)

6. Solar gains

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[Jan]	Area m2				Solar flux Table 6a W/m2	Specific data or Table 6b		g	Specific data or Table 6c	FF	Access factor Table 6d		Gains W
Southwest	6.0800				36.7938	0.6300			0.7000		0.7700		68.3676 (79)
Northwest	7.5600				11.2829	0.6300			0.7000		0.7700		26.0685 (81)
Solar gains	94.4361	169.5185	254.9422	354.4366	432.1860	444.5384	422.1413	361.7705	289.0244	193.5554	114.6896	79.7973 (83)	
Total gains	570.9397	657.0905	722.2735	805.5866	860.5340	854.6014	816.6167	756.9376	696.1658	617.4762	564.2845	546.3330 (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	72.9366	73.2190	73.4980	74.8372	75.0932	76.3084	76.3084	76.5378	75.8357	75.0932	74.5771	74.0451	
alpha	5.8624	5.8813	5.8999	5.9891	6.0062	6.0872	6.0872	6.1025	6.0557	6.0062	5.9718	5.9363	
util living area	0.9849	0.9661	0.9240	0.8039	0.6234	0.4348	0.3138	0.3527	0.5719	0.8561	0.9655	0.9878 (86)	
MIT	20.2084	20.4040	20.6350	20.8756	20.9752	20.9976	20.9997	20.9995	20.9887	20.8478	20.5049	20.1829 (87)	
Th 2	20.2130	20.2158	20.2186	20.2315	20.2339	20.2452	20.2452	20.2473	20.2409	20.2339	20.2290	20.2239 (88)	
util rest of house	0.9811	0.9581	0.9073	0.7702	0.5771	0.3842	0.2601	0.2952	0.5126	0.8212	0.9560	0.9847 (89)	
MIT 2	19.2993	19.5455	19.8288	20.1132	20.2144	20.2439	20.2452	20.2471	20.2336	20.0919	19.6845	19.2757 (90)	
Living area fraction	fLA = Living area / (4) = 0.3611 (91)												
MIT	19.6276	19.8555	20.1200	20.3885	20.4891	20.5161	20.5176	20.5188	20.5063	20.3649	19.9807	19.6033 (92)	
Temperature adjustment	0.0000												
adjusted MIT	19.6276	19.8555	20.1200	20.3885	20.4891	20.5161	20.5176	20.5188	20.5063	20.3649	19.9807	19.6033 (93)	
8. Space heating requirement													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9776	0.9538	0.9050	0.7774	0.5928	0.4024	0.2795	0.3159	0.5336	0.8276	0.9523	0.9816 (94)	
Useful gains	558.1404	626.7454	653.6488	626.2762	510.1099	343.9229	228.2195	239.1483	371.4576	511.0521	537.3959	536.2547 (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	934.4652	908.2657	824.0150	682.6223	520.4496	344.7430	228.2898	239.2935	375.6354	578.2293	768.0152	925.0229 (97)	
Space heating kWh	279.9856	189.1816	126.7525	40.5692	7.6928	0.0000	0.0000	0.0000	0.0000	49.9798	166.0459	289.2435 (98a)	
Space heating requirement - total per year (kWh/year)	1149.4509												
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	279.9856	189.1816	126.7525	40.5692	7.6928	0.0000	0.0000	0.0000	0.0000	49.9798	166.0459	289.2435 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)	1149.4509												
Space heating per m2	(98c) / (4) = 15.9646 (99)												
9a. Energy requirements - Individual heating systems, including micro-CHP													
Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													92.3000 (206)
Efficiency of main space heating system 2 (in %)													88.8000 (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	279.9856	189.1816	126.7525	40.5692	7.6928	0.0000	0.0000	0.0000	0.0000	49.9798	166.0459	289.2435 (98)	
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)	
Space heating fuel (main heating system)	303.3431	204.9639	137.3266	43.9536	8.3346	0.0000	0.0000	0.0000	0.0000	54.1493	179.8981	313.3732 (211)	
Space heating efficiency (main heating system 2)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)	
Space heating fuel used, main system 2	0.0000 (213)												
Water heating													
Water heating requirement	205.3335	181.2428	191.9356	167.5941	161.6088	144.7234	142.3041	148.5400	150.7925	169.2000	181.1596	202.9645 (64)	
Efficiency of water heater (217)m	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000 (216)	
Fuel for water heating, kWh/month	257.3101	227.1213	240.5208	210.0176	202.5173	181.3576	178.3259	186.1404	188.9631	212.0301	227.0171	254.3415 (219)	
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	11.1260	10.0493	11.1260	10.7671	11.1260	10.7671	11.1260	10.7671	11.1260	10.7671	11.1260	11.1260 (231)	
Lighting	21.4502	17.2082	15.4940	11.3516	8.7683	7.1638	7.9987	10.3971	13.5048	17.7190	20.0135	22.0464 (232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-8.6797	-13.4237	-21.1442	-26.1287	-30.3278	-29.1184	-28.7719	-26.0731	-21.7373	-16.3315	-9.9557	-7.3727 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-1.8625	-4.0798	-8.4218	-13.1259	-17.8355	-18.0944	-17.8761	-14.9077	-10.6381	-5.9790	-2.5317	-1.4608 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

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(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1245.3423	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2565.6626	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												131.0000	(231)
Electricity for lighting (calculated in Appendix L)												173.1156	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-355.8780	(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												3759.2424	(238)

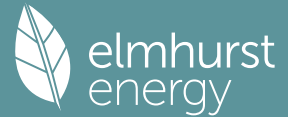
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1245.3423	0.2100	261.5219	(261)
Space heating - main system 2	0.0000	0.2100	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2565.6626	0.2100	538.7892	(264)
Space and water heating			800.3110	(265)
Pumps, fans and electric keep-hot	131.0000	0.1387	18.1713	(267)
Energy for lighting	173.1156	0.1443	24.9859	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-239.0647	0.1327	-31.7235	
PV Unit electricity exported	-116.8133	0.1248	-14.5830	
Total			-46.3065	(269)
Total CO2, kg/year			797.1618	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.0700	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1245.3423	1.1300	1407.2368	(275)
Space heating - main system 2	0.0000	1.1300	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2565.6626	1.1300	2899.1988	(278)
Space and water heating			4306.4355	(279)
Pumps, fans and electric keep-hot	131.0000	1.5128	198.1768	(281)
Energy for lighting	173.1156	1.5338	265.5304	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-239.0647	1.4903	-356.2833	
PV Unit electricity exported	-116.8133	0.4582	-53.5237	
Total			-409.8070	(283)
Total Primary energy kWh/year			4360.3357	(286)
Target Primary Energy Rate (TPER)			60.5600	(287)

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Plot Reference	02flr sample 5 Plot 10				Issued on Date	13/12/2025	
Assessment Reference	Block E 1B2P			Plot Type Ref	Block E 1B2P		
Plot Address					SAP Version	10.2	
SAP Rating	87 B		DER	1.12		TER	11.98
Environmental	99 A		% DER < TER				90.65
CO ₂ Emissions (t/year)	0.05		DFEE	15.81		TFEE	18.05
Compliance Check	See BREL		% DFEE < TFEE				12.38
% DPER < TPER	82.26		DPER	11.74		TPER	66.17
Assessor Details	Mr. Andrew Jones				Assessor ID	N955-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	50.0000 (1b)	2.5000 (2b)	125.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	125.0000 (5)

2. Ventilation rate

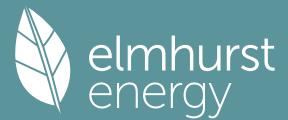
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1162 (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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												86.4000 (23c)
Effective ac	0.2162	0.2133	0.2104	0.1959	0.1930	0.1784	0.1784	0.1755	0.1842	0.1930	0.1988	0.2046 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows Open			7.9600	1.1450	9.1145		(27)
External Wall 1	17.5000	7.9600	9.5400	0.1500	1.4310	70.0000	667.8000 (29a)
Total net area of external elements Aum(A, m ²)			17.5000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	10.5455		(33)
Main dwelling							
Party Wall hall			55.0000	0.0000	0.0000	180.0000	9900.0000 (32)
Party Floor 1			50.0000			40.0000	2000.0000 (32a)
Party Ceiling 1			50.0000			30.0000	1500.0000 (32b)
Internal Wall 1			84.4500			9.0000	760.0500 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	14827.8500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							296.5570 (35)
Thermal bridges (User defined value 0.075 * total exposed area)							1.3125 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	11.8580 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	8.9190	8.7991	8.6793	8.0798	7.9600	7.3605	7.3605	7.2407	7.6003	7.9600	8.1997	8.4395	(38)
Heat transfer coeff	20.7770	20.6571	20.5373	19.9378	19.8180	19.2186	19.2186	19.0987	19.4583	19.8180	20.0577	20.2975	(39)
Average = Sum(39)m / 12 =												19.9079	
HLP	0.4155	0.4131	0.4107	0.3988	0.3964	0.3844	0.3844	0.3820	0.3892	0.3964	0.4012	0.4059	(40)
HLP (average)												0.3982	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6901 (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	60.5412	59.6421	58.3759	56.0413	54.2933	52.3549	51.3079	52.5652	53.9342	56.0083	58.3909	60.3365	(42b)
Hot water usage for other uses	31.9383	30.7769	29.6155	28.4541	27.2927	26.1314	26.1314	27.2927	28.4541	29.6155	30.7769	31.9383	(42c)
Average daily hot water use (litres/day)												85.1660	(43)
Daily hot water use	92.4795	90.4190	87.9914	84.4955	81.5860	78.4863	77.4393	79.8580	82.3883	85.6238	89.1678	92.2748	(44)
Energy conte	146.4649	128.7554	135.2396	115.6701	109.8304	96.5080	93.6561	98.8808	101.5930	116.1907	127.0359	144.4801	(45)
Energy content (annual)										Total = Sum(45)m =		1414.3051	
Distribution loss (46)m = 0.15 x (45)m	21.9697	19.3133	20.2859	17.3505	16.4746	14.4762	14.0484	14.8321	15.2390	17.4286	19.0554	21.6720	(46)
Water storage loss (or HIU loss):													
Store volume												15.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2500	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.1500	(55)
Total storage loss	4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500	(56)
If cylinder contains dedicated solar storage	4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	174.3773	153.9666	163.1520	142.6821	137.7428	123.5200	121.5685	126.7932	128.6050	144.1031	154.0479	172.3925	(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	174.3773	153.9666	163.1520	142.6821	137.7428	123.5200	121.5685	126.7932	128.6050	144.1031	154.0479	172.3925	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1742.9511	(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	71.0295	62.9801	67.2971	60.0699	58.8485	53.6985	53.4706	55.2078	55.3893	60.9633	63.8490	70.3695	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.1176	88.7016	80.1176	82.7882	80.1176	82.7882	80.1176	80.1176	82.7882	80.1176	82.7882	80.1176	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.2339	148.7618	144.9117	136.7153	126.3689	116.6447	110.1484	108.6205	112.4706	120.6670	131.0134	140.7376	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	(71)
Water heating gains (Table 5)	95.4698	93.7204	90.4531	83.4304	79.0975	74.5813	71.8690	74.2040	76.9296	81.9400	88.6792	94.5827	(72)
Total internal gains	371.1728	379.5354	363.8339	351.2855	333.9355	322.3657	310.4865	311.2937	320.5399	331.0761	350.8323	363.7894	(73)

6. Solar gains

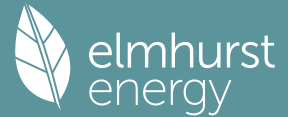
[Jan]					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
-----					Northwest	7.9600	11.2829	0.4000	0.6000	0.7700		14.9376 (81)	

Solar gains	14.9376	30.4059	54.7817	89.9672	120.9336	128.9280	120.6095	96.1513	66.7523	37.1584	18.7953	12.1988	(83)
Total gains	386.1104	409.9412	418.6155	441.2527	454.8692	451.2938	431.0961	407.4450	387.2922	368.2344	369.6277	375.9882	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	198.2404	199.3909	200.5548	206.5843	207.8340	214.3162	214.3162	215.6615	211.6754	207.8340	205.3496	202.9239	
alpha	14.2160	14.2927	14.3703	14.7723	14.8556	15.2877	15.2877	15.3774	15.1117	14.8556	14.6900	14.5283	
util living area	0.8738	0.8033	0.7098	0.5467	0.4052	0.2725	0.1962	0.2156	0.3467	0.5597	0.7513	0.8808	(86)

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MIT	20.9797	20.9930	20.9986	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	20.9977	20.9792 (87)
Th 2	20.5988	20.6011	20.6033	20.6145	20.6167	20.6279	20.6279	20.6302	20.6235	20.6167	20.6123	20.6078 (88)
util rest of house	0.8577	0.7852	0.6908	0.5293	0.3885	0.2567	0.1796	0.1983	0.3278	0.5391	0.7312	0.8653 (89)
MIT 2	20.5831	20.5959	20.6024	20.6145	20.6167	20.6279	20.6279	20.6302	20.6235	20.6167	20.6106	20.5915 (90)
Living area fraction									fLA = Living area / (4) =			0.5200 (91)
MIT	20.7893	20.8024	20.8084	20.8149	20.8160	20.8214	20.8214	20.8225	20.8193	20.8160	20.8119	20.7931 (92)
Temperature adjustment												0.0000
adjusted MIT	20.7893	20.8024	20.8084	20.8149	20.8160	20.8214	20.8214	20.8225	20.8193	20.8160	20.8119	20.7931 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8655	0.7944	0.7007	0.5383	0.3972	0.2649	0.1882	0.2073	0.3376	0.5498	0.7416	0.8727 (94)	
Useful gains	334.1787	325.6485	293.3115	237.5464	180.6611	119.5665	81.1294	84.4636	130.7454	202.4478	274.1053	328.1367 (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	342.5992	328.4983	293.8558	237.5581	180.6612	119.5665	81.1294	84.4636	130.7455	202.4604	275.0294	336.7977 (97)	
Space heating kWh	6.2649	1.9150	0.4050	0.0084	0.0001	0.0000	0.0000	0.0000	0.0000	0.0094	0.6654	6.4437 (98a)	
Space heating requirement - total per year (kWh/year)												15.7118	
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	6.2649	1.9150	0.4050	0.0084	0.0001	0.0000	0.0000	0.0000	0.0000	0.0094	0.6654	6.4437 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												15.7118	
Space heating per m2										(98c) / (4) =		0.3142 (99)	

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (301)
Fraction of space heat from community system													1.0000 (302)
Fraction of heat from community Heat pump-Space													1.0000 (303a)
Fraction of heat from community Heat pump-Water													1.0000 (303b)
Factor for control and charging method (Table 4c(3)) for space heating													1.0500 (305)
Distribution loss factor (Table 12c) for community heating system													1.0000 (306)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating:													
Space heating requirement	6.2649	1.9150	0.4050	0.0084	0.0001	0.0000	0.0000	0.0000	0.0000	0.0094	0.6654	6.4437 (98)	
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00													
307a	6.5781	2.0108	0.4252	0.0088	0.0001	0.0000	0.0000	0.0000	0.0000	0.0098	0.6987	6.7659	
Space heating requirement	6.5781	2.0108	0.4252	0.0088	0.0001	0.0000	0.0000	0.0000	0.0000	0.0098	0.6987	6.7659 (307)	
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)													0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)	
Water heating													
Annual water heating requirement	174.3773	153.9666	163.1520	142.6821	137.7428	123.5200	121.5685	126.7932	128.6050	144.1031	154.0479	172.3925 (64)	
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00													
310b	174.3773	153.9666	163.1520	142.6821	137.7428	123.5200	121.5685	126.7932	128.6050	144.1031	154.0479	172.3925	
Water heating fuel	174.3773	153.9666	163.1520	142.6821	137.7428	123.5200	121.5685	126.7932	128.6050	144.1031	154.0479	172.3925 (310)	
Cooling System Energy Efficiency Ratio													0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)	
Pumps and Fa	9.7140	8.7740	9.7140	9.4007	9.7140	9.4007	9.7140	9.7140	9.4007	9.7140	9.4007	9.7140 (331)	
Lighting	17.7795	14.2634	12.8426	9.4090	7.2678	5.9379	6.6299	8.6178	11.1937	14.6868	16.5887	18.2737 (332)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-11.4813	-17.3463	-26.7544	-32.3531	-36.9056	-35.2244	-34.8011	-31.8324	-26.9518	-20.7977	-13.0289	-9.7944 (333a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)	
Annual totals kWh/year													
Space heating fuel - community heating													16.4974 (307)
Space heating fuel - secondary													0.0000 (309)
Water heating fuel - community heating													1742.9511 (310)
Efficiency of water heater													0.0000 (311)
Electricity used for heat distribution (space)													0.1650 (313)
Electricity used for heat distribution (water)													1.7239 (313)
Space cooling fuel													0.0000 (321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)													
mechanical ventilation fans (SFP = 0.7500)													114.3750 (330a)
Total electricity for the above, kWh/year													114.3750 (331)
Electricity for lighting (calculated in Appendix L)													143.4908 (332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-297.2713 (333)
Wind generation													0.0000 (334)
Hydro-electric generation (Appendix N)													0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)													0.0000 (335)
Appendix Q - special features													
Energy saved or generated													-0.0000 (336)
Energy used													0.0000 (337)
Total delivered energy for all uses													1720.0431 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
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Efficiency of heat source Heat pump			330.0000 (367)
Space heating from Heat pump	4.9992	0.1618	0.8091 (367)
Efficiency of heat source Heat pump			440.0000 (367)
Water heating from Heat pump	396.1252	0.0000	0.0000 (368)
Electrical energy for heat distribution (space & water)	0.1650	0.0000	2.4844 (372)
Overall CO2 factor for heat network (space)			0.0507 (386)
Overall CO2 factor for heat network (water)			0.0335 (386)
Total CO2 associated with community systems			59.1509 (373)
Space and water heating			59.1509 (376)
Pumps, fans and electric keep-hot	114.3750	0.1387	15.8652 (378)
Energy for lighting	143.4908	0.1443	20.7102 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-297.2713	0.1331	-39.5738
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-39.5738 (380)
Total CO2, kg/year			56.1524 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.1200 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			330.0000 (467a)
Space heating from Heat pump	4.9992	1.5989	7.9932 (467)
Efficiency of heat source Heat pump			440.0000 (467b)
Water heating from Heat pump	396.1252	0.0000	0.0000 (468)
Electrical energy for heat distribution (space & water)	0.1650	0.0000	26.7811 (472)
Overall CO2 factor for heat network (space)			0.5005 (486)
Overall CO2 factor for heat network (water)			0.3610 (486)
Total CO2 associated with community systems			637.4419 (473)
Space and water heating			637.4419 (476)
Pumps, fans and electric keep-hot	114.3750	1.5128	173.0265 (478)
Energy for lighting	143.4908	1.5338	220.0910 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-297.2713	1.4919	-443.5045
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-443.5045 (480)
Total Primary energy kWh/year			587.0549 (483)
Dwelling Primary energy Rate (DPER)			11.7400 (484)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	50.0000	2.5000	125.0000
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000		
Dwelling volume			125.0000

2. Ventilation rate

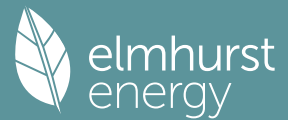
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	20.0000 / (5) = 0.1600 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4100 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (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	0.4051	0.3972	0.3892	0.3495	0.3416	0.3019	0.3019	0.2939	0.3178	0.3416	0.3575	0.3734 (22b)
Effective ac	0.5821	0.5789	0.5758	0.5611	0.5583	0.5456	0.5456	0.5432	0.5505	0.5583	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
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Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K						
TER Opening Type			7.9600	1.1450	9.1145			(27)					
External Wall 1	17.5000	7.9600	9.5400	0.1800	1.7172			(29a)					
Total net area of external elements Aum(A, m2)			17.5000					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		10.8317			(33)					
Main dwelling													
Party Wall hall			55.0000	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							296.5570	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				44.0000	0.0000	0.0000							
E7 Party floor between dwellings (in blocks of flats)				14.0000	0.0700	0.9800							
E1 Steel lintel with perforated steel base plate				3.8000	0.0500	0.1900							
E3 Sill				3.8000	0.0500	0.1900							
E4 Jamb				8.2000	0.0500	0.4100							
E18 Party wall between dwellings				10.0000	0.0600	0.6000							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							2.3700	(36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	13.2017	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	24.0102	23.8788	23.7499	23.1447	23.0315	22.5044	22.5044	22.4068	22.7074	23.0315	23.2605	23.5000	(38)
Average = Sum(39)m / 12 =	37.2119	37.0805	36.9516	36.3464	36.2332	35.7061	35.7061	35.6085	35.9091	36.2332	36.4622	36.7017	(39)
												36.3459	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.7442	0.7416	0.7390	0.7269	0.7247	0.7141	0.7141	0.7122	0.7182	0.7247	0.7292	0.7340	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6901	(42)
Hot water usage for mixer showers														
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for other uses	60.5412	59.6421	58.3759	56.0413	54.2933	52.3549	51.3079	52.5652	53.9342	56.0083	58.3909	60.3365		(42b)
Average daily hot water use (litres/day)	31.9383	30.7769	29.6155	28.4541	27.2927	26.1314	26.1314	27.2927	28.4541	29.6155	30.7769	31.9383		(42c)
												85.1660		(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Energy content (annual)	92.4795	90.4190	87.9914	84.4955	81.5860	78.4863	77.4393	79.8580	82.3883	85.6238	89.1678	92.2748		(44)
Distribution loss (46)m = 0.15 x (45)m	146.4649	128.7554	135.2396	115.6701	109.8304	96.5080	93.6561	98.8808	101.5930	116.1907	127.0359	144.4801		(45)
Water storage loss (or HIU loss):	21.9697	19.3133	20.2859	17.3505	16.4746	14.4762	14.0484	14.8321	15.2390	17.4286	19.0554	21.6720		(46)
Store volume													15.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):													0.4337	(48)
Temperature factor from Table 2b													0.5400	(49)
Enter (49) or (54) in (55)													0.2342	(55)
Total storage loss	7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595		(56)
If cylinder contains dedicated solar storage	7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595		(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624		(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(61)
Total heat required for water heating calculated for each month	176.9868	156.3236	165.7615	145.2074	140.3524	126.0454	124.1780	129.4027	131.1304	146.7126	156.5733	175.0020		(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	176.9868	156.3236	165.7615	145.2074	140.3524	126.0454	124.1780	129.4027	131.1304	146.7126	156.5733	175.0020		(64)
12Total per year (kWh/year)													1773.6762	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000	(64a)
Heat gains from water heating, kWh/month	73.1171	64.8657	69.3847	62.0902	60.9362	55.7188	55.5582	57.2954	57.4096	63.0509	65.8693	72.4572		(65)

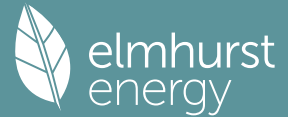
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	77.5536	85.8629	77.5536	80.1387	77.5536	80.1387	77.5536	77.5536	80.1387	77.5536	80.1387	77.5536	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	147.2339	148.7618	144.9117	136.7153	126.3689	116.6447	110.1484	108.6205	112.4706	120.6670	131.0134	140.7376	(68)
Pumps, fans	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	(69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Water heating gains (Table 5)	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	(71)
Total internal gains	98.2757	96.5264	93.2590	86.2364	81.9034	77.3872	74.6750	77.0100	79.7355	84.7459	91.4852	97.3887	(72)
	374.4147	382.5026	367.0758	354.4419	337.1774	322.5221	310.7284	311.5356	320.6963	334.3180	353.9888	367.0313	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W
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				W/m2		or Table 6b		or Table 6c		Table 6d			
Northwest		7.9600		11.2829		0.6300		0.7000		0.7700		27.4478 (81)	
Solar gains	27.4478	55.8707	100.6613	165.3148	222.2155	236.9053	221.6200	176.6781	122.6574	68.2785	34.5364	22.4152	(83)
Total gains	401.8625	438.3733	467.7371	519.7567	559.3930	559.4274	532.3485	488.2137	443.3537	402.5965	388.5252	389.4466	(84)
7. Mean internal temperature (heating season)													
Temperature during heating periods in the living area from Table 9, Th1 (C)													
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	110.6863	111.0786	111.4660	113.3220	113.6761	115.3542	115.3542	115.6705	114.7020	113.6761	112.9620	112.2249	
alpha	8.3791	8.4052	8.4311	8.5548	8.5784	8.6903	8.6903	8.7114	8.6468	8.5784	8.5308	8.4817	
util living area	0.9907	0.9790	0.9441	0.8070	0.5993	0.4084	0.2951	0.3355	0.5572	0.8636	0.9737	0.9924	(86)
MIT	20.5539	20.6646	20.8116	20.9593	20.9965	20.9999	21.0000	21.0000	20.9986	20.9416	20.7427	20.5396	(87)
Th 2	20.3019	20.3042	20.3065	20.3171	20.3191	20.3284	20.3284	20.3301	20.3248	20.3191	20.3151	20.3109	(88)
util rest of house	0.9876	0.9726	0.9285	0.7719	0.5566	0.3656	0.2501	0.2866	0.5035	0.8266	0.9646	0.9899	(89)
MIT 2	19.7930	19.9328	20.1118	20.2816	20.3167	20.3283	20.3284	20.3301	20.3240	20.2693	20.0399	19.7825	(90)
Living area fraction									fLA =	Living area / (4) =		0.5200	(91)
MIT	20.1887	20.3134	20.4757	20.6340	20.6702	20.6775	20.6776	20.6784	20.6748	20.6189	20.4053	20.1762	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1887	20.3134	20.4757	20.6340	20.6702	20.6775	20.6776	20.6784	20.6748	20.6189	20.4053	20.1762	(93)
8. Space heating requirement													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9871	0.9727	0.9326	0.7886	0.5787	0.3878	0.2735	0.3120	0.5314	0.8437	0.9659	0.9893	(94)
Useful gains	396.6587	426.3974	436.2117	409.8857	323.7196	216.9695	145.5943	152.3444	235.6189	339.6594	375.2958	385.2940	(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	591.2474	571.5346	516.4244	426.4894	325.0187	217.0049	145.5957	152.3485	236.0948	363.0164	485.1423	586.3540	(97)
Space heating kWh	144.7740	97.5322	59.6783	11.9546	0.9665	0.0000	0.0000	0.0000	0.0000	17.3776	79.0895	149.5886	(98a)
Space heating requirement - total per year (kWh/year)												560.9614	
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	144.7740	97.5322	59.6783	11.9546	0.9665	0.0000	0.0000	0.0000	0.0000	17.3776	79.0895	149.5886	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												560.9614	
Space heating per m2										(98c) / (4) =		11.2192	(99)
9a. Energy requirements - Individual heating systems, including micro-CHP													
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												88.8000	(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	144.7740	97.5322	59.6783	11.9546	0.9665	0.0000	0.0000	0.0000	0.0000	17.3776	79.0895	149.5886	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	156.8516	105.6687	64.6569	12.9519	1.0472	0.0000	0.0000	0.0000	0.0000	18.8273	85.6874	162.0679	(211)
Space heating efficiency (main heating system 2)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement												175.0020	(64)
Efficiency of water heater	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	(216)
(217)m	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	(217)
Fuel for water heating, kWh/month	221.7880	195.8943	207.7212	181.9642	175.8802	157.9516	155.6115	162.1588	164.3238	183.8504	196.2071	219.3008	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
(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	11.1260	10.0493	11.1260	10.7671	11.1260	10.7671	11.1260	11.1260	10.7671	11.1260	10.7671	11.1260	(231)
Lighting	16.1141	12.9273	11.6396	8.5277	6.5870	5.3817	6.0089	7.8106	10.1452	13.3111	15.0348	16.5620	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-6.0757	-9.4236	-14.8876	-18.4580	-21.4862	-20.6606	-20.4238	-18.4833	-15.3679	-11.4971	-6.9806	-5.1585	(233a)
(233a)m	-6.0757	-9.4236	-14.8876	-18.4580	-21.4862	-20.6606	-20.4238	-18.4833	-15.3679	-11.4971	-6.9806	-5.1585	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
(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)	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)
(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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-1.2453	-2.7317	-5.6443	-8.8022	-11.9605	-12.1260	-11.9706	-9.9756	-7.1151	-3.9962	-1.6912	-0.9759	(233b)
(233b)m	-1.2453	-2.7317	-5.6443	-8.8022	-11.9605	-12.1260	-11.9706	-9.9756	-7.1151	-3.9962	-1.6912	-0.9759	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
(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)	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)
(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)	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)
(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												607.7588	(211)

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Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2222.6518	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	131.0000	(231)
Electricity for lighting (calculated in Appendix L)	130.0500	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-247.1375	(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	2844.3232	(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	607.7588	0.2100	127.6294 (261)
Space heating - main system 2	0.0000	0.2100	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2222.6518	0.2100	466.7569 (264)
Space and water heating			594.3862 (265)
Pumps, fans and electric keep-hot	131.0000	0.1387	18.1713 (267)
Energy for lighting	130.0500	0.1443	18.7702 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-168.9030	0.1326	-22.4014
PV Unit electricity exported	-78.2345	0.1248	-9.7671
Total			-32.1685 (269)
Total CO2, kg/year			599.1593 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.9800 (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	607.7588	1.1300	686.7675 (275)
Space heating - main system 2	0.0000	1.1300	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2222.6518	1.1300	2511.5966 (278)
Space and water heating			3198.3641 (279)
Pumps, fans and electric keep-hot	131.0000	1.5128	198.1768 (281)
Energy for lighting	130.0500	1.5338	199.4751 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-168.9030	1.4901	-251.6759
PV Unit electricity exported	-78.2345	0.4582	-35.8479
Total			-287.5238 (283)
Total Primary energy kWh/year			3308.4921 (286)
Target Primary Energy Rate (TPER)			66.1700 (287)

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Plot Reference	02flr sample 6 Plot 11			Issued on Date	13/12/2025
Assessment Reference	Block F 3B5P	Plot Type Ref	Block F 3B5P		
Plot Address				SAP Version	10.2
SAP Rating	88 B	DER	1.39	TER	11.30
Environmental	99 A	% DER < TER			87.70
CO ₂ Emissions (t/year)	0.1	DFEE	26.48	TFEE	27.23
Compliance Check	See BREL	% DFEE < TFEE			2.76
% DPER < TPER	76.62	DPER	14.38	TPER	61.53
Assessor Details	Mr. Andrew Jones			Assessor ID	N955-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	85.5000 (1b)	2.5000 (2b)	213.7500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	213.7500 (5)

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	2	(19)

Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												85.5000 (23c)
Effective ac	0.2351	0.2319	0.2287	0.2128	0.2096	0.1936	0.1936	0.1904	0.2000	0.2096	0.2159	0.2223 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows Open			22.2100	1.1450	25.4313		(27)
External Wall 1	60.0000	22.2100	37.7900	0.1500	5.6685	70.0000	2645.3000 (29a)
Total net area of external elements Aum (A, m ²)			60.0000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.0998		(33)
Main dwelling							
Party Wall hall			39.0000	0.0000	0.0000	180.0000	7020.0000 (32)
Party Floor 1			85.5000			40.0000	3420.0000 (32a)
Party Ceiling 1			85.5000			30.0000	2565.0000 (32b)
Internal Wall 1			208.0000			9.0000	1872.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	17522.3000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							204.9392 (35)
Thermal bridges (User defined value 0.075 * total exposed area)							4.5000 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	35.5998 (37)

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Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)m \times (5)$

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(38)
Heat transfer coeff	16.5807	16.3559	16.1310	15.0069	14.7820	13.6578	13.6578	13.4330	14.1075	14.7820	15.2317	15.6814	(39)
Average = Sum(39)m / 12 =	52.1805	51.9557	51.7308	50.6067	50.3818	49.2576	49.2576	49.0328	49.7073	50.3818	50.8315	51.2812	(40)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(40)
HLP (average)	0.6103	0.6077	0.6050	0.5919	0.5893	0.5761	0.5761	0.5735	0.5814	0.5893	0.5945	0.5998	(41)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	(42)

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5590 (42)
Hot water usage for mixer showers													(42a)
Hot water usage for baths													(42b)
Hot water usage for other uses													(42c)
Average daily hot water use (litres/day)													(43)
Daily hot water use													
Energy content (annual)													(44)
Distribution loss (46)m = $0.15 \times (45)m$													(45)
Water storage loss (or HIU loss):													(46)
Store volume													(47)
a) If manufacturer declared loss factor is known (kWh/day):													(48)
Temperature factor from Table 2b													(49)
Enter (49) or (54) in (55)													(50)
Total storage loss													(51)
If cylinder contains dedicated solar storage													(52)
Primary loss													(53)
Combi loss													(54)
Total heat required for water heating calculated for each month													(55)
WWHRS													(56)
PV diverter													(57)
Solar input													(58)
FGHRS													(59)
Output from w/h													(60)
12Total per year (kWh/year)													(61)
Electric shower(s)													(62)
Heat gains from water heating, kWh/month													(63)

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

Metabolic gains (Table 5), Watts													
(66)m													(67)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													(68)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													(69)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													(70)
Pumps, fans													(71)
Losses e.g. evaporation (negative values) (Table 5)													(72)
Water heating gains (Table 5)													(73)
Total internal gains													(74)

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

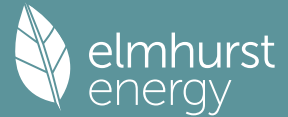
Northeast					9.0700	11.2829	0.4000	0.6000			0.7700	17.0206 (75)
Southeast					5.0800	36.7938	0.4000	0.6000			0.7700	31.0873 (77)
Northwest					8.0600	11.2829	0.4000	0.6000			0.7700	15.1252 (76)

Solar gains	63.2331	118.3869	190.3436	283.3830	360.8032	377.2801	355.7956	295.1187	222.1028	138.4897	77.6832	52.8561 (83)
Total gains	585.1654	652.9345	702.2251	777.3271	829.1295	828.4814	789.4801	729.3963	669.7704	601.5219	569.4099	563.4817 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	93.2782	93.6819	94.0890	96.1792	96.6084	98.8132	98.8132	99.2664	97.9193	96.6084	95.7537	94.9141	
alpha	7.2185	7.2455	7.2726	7.4119	7.4406	7.5875	7.5875	7.6178	7.5280	7.4406	7.3836	7.3276	

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util living area	0.9807	0.9581	0.9060	0.7548	0.5616	0.3804	0.2745	0.3092	0.5105	0.8126	0.9528	0.9841 (86)
MIT	20.5087	20.6515	20.8118	20.9575	20.9951	20.9998	21.0000	21.0000	20.9982	20.9417	20.7281	20.4918 (87)
Th 2	20.4207	20.4231	20.4255	20.4373	20.4397	20.4515	20.4515	20.4539	20.4468	20.4397	20.4349	20.4302 (88)
util rest of house												
MIT 2	0.9767	0.9500	0.8900	0.7265	0.5288	0.3478	0.2403	0.2725	0.4702	0.7814	0.9425	0.9807 (89)
Living area fraction	19.9754	20.1154	20.2678	20.4055	20.4366	20.4514	20.4515	20.4539	20.4458	20.3970	20.2009	19.9672 (90)
MIT	20.0895	20.2302	20.3842	20.5237	20.5561	20.5688	20.5689	20.5708	20.5641	20.5136	20.3138	20.0794 (91)
Temperature adjustment												0.0000 (92)
adjusted MIT	20.0895	20.2302	20.3842	20.5237	20.5561	20.5688	20.5689	20.5708	20.5641	20.5136	20.3138	20.0794 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9739	0.9470	0.8888	0.7309	0.5357	0.3548	0.2476	0.2804	0.4787	0.7857	0.9400	0.9782	(94)
Useful gains	569.9049	618.3291	624.1343	568.1838	444.1264	293.9361	195.4962	204.4961	320.6462	472.6315	535.2513	551.2239	(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	823.9054	796.4885	718.2414	588.2358	446.1874	294.0093	195.4999	204.5053	321.3108	499.4648	671.6753	814.3161	(97)
Space heating kWh	188.9764	119.7231	70.0156	14.4375	1.5333	0.0000	0.0000	0.0000	0.0000	19.9640	98.2253	195.7406	(98a)
Space heating requirement - total per year (kWh/year)												708.6158	
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	188.9764	119.7231	70.0156	14.4375	1.5333	0.0000	0.0000	0.0000	0.0000	19.9640	98.2253	195.7406	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												708.6158	
Space heating per m2										(98c) / (4) =		8.2879	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space												1.0000	(303a)
Fraction of heat from community Heat pump-Water												1.0000	(303b)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500	(305)
Distribution loss factor (Table 12c) for community heating system												1.0000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	188.9764	119.7231	70.0156	14.4375	1.5333	0.0000	0.0000	0.0000	0.0000	19.9640	98.2253	195.7406	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00													
307a	198.4252	125.7093	73.5164	15.1593	1.6100	0.0000	0.0000	0.0000	0.0000	20.9622	103.1365	205.5276	
Space heating requirement	198.4252	125.7093	73.5164	15.1593	1.6100	0.0000	0.0000	0.0000	0.0000	20.9622	103.1365	205.5276	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	215.1835	189.8388	200.8307	174.9086	168.3424	150.4079	147.6617	154.3421	156.9096	176.4747	189.4411	212.6457	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00													
310b	215.1835	189.8388	200.8307	174.9086	168.3424	150.4079	147.6617	154.3421	156.9096	176.4747	189.4411	212.6457	
Water heating fuel	215.1835	189.8388	200.8307	174.9086	168.3424	150.4079	147.6617	154.3421	156.9096	176.4747	189.4411	212.6457	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	14.6731	13.2531	14.6731	14.1997	14.6731	14.1997	14.6731	14.6731	14.1997	14.6731	14.1997	14.6731	(331)
Lighting	25.8068	20.7031	18.6409	13.6571	10.5491	8.6187	9.6233	12.5087	16.2476	21.3177	24.0783	26.5240	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-12.0924	-18.6247	-29.2814	-36.1130	-41.8177	-40.1207	-39.6106	-35.9076	-29.9559	-22.5885	-13.8349	-10.2763	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												744.0466	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												2136.9869	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution (space)												7.4405	(313)
Electricity used for heat distribution (water)												2.1265	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6625)													
mechanical ventilation fans (SFP = 0.6625)												172.7634	(330a)
Total electricity for the above, kWh/year												172.7634	(331)
Electricity for lighting (calculated in Appendix L)												208.2753	(332)

12b. Carbon dioxide emissions - Community heating scheme

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	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			330.0000 (367)
Space heating from Heat pump	225.4687	0.1586	35.7608 (367)
Efficiency of heat source Heat pump			440.0000 (367)
Water heating from Heat pump	485.6788	0.0000	0.0000 (368)
Electrical energy for heat distribution (space & water)	7.4405	0.0000	4.1956 (372)
Overall CO2 factor for heat network (space)			0.0496 (386)
Overall CO2 factor for heat network (water)			0.0335 (386)
Total CO2 associated with community systems			108.4894 (373)
Space and water heating			108.4894 (376)
Pumps, fans and electric keep-hot	172.7634	0.1387	23.9644 (378)
Energy for lighting	208.2753	0.1443	30.0606 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-330.2236	0.1328	-43.8388
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-43.8388 (380)
Total CO2, kg/year			118.6756 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.3900 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			330.0000 (467a)
Space heating from Heat pump	225.4687	1.5871	357.8406 (467)
Efficiency of heat source Heat pump			440.0000 (467b)
Water heating from Heat pump	485.6788	0.0000	0.0000 (468)
Electrical energy for heat distribution (space & water)	7.4405	0.0000	44.3289 (472)
Overall CO2 factor for heat network (space)			0.4968 (486)
Overall CO2 factor for heat network (water)			0.3611 (486)
Total CO2 associated with community systems			1141.2636 (473)
Space and water heating			1141.2636 (476)
Pumps, fans and electric keep-hot	172.7634	1.5128	261.3565 (478)
Energy for lighting	208.2753	1.5338	319.4596 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-330.2236	1.4905	-492.2095
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-492.2095 (480)
Total Primary energy kWh/year			1229.8702 (483)
Dwelling Primary energy Rate (DPER)			14.3800 (484)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	85.5000	2.5000	213.7500
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.5000		
Dwelling volume			

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	30.0000 / (5) = 0.1404 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3904 (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) = 0.3318 (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	0.4230	0.4147	0.4065	0.3650	0.3567	0.3152	0.3152	0.3069	0.3318	0.3567	0.3733	0.3899 (22b)
Effective ac	0.5895	0.5860	0.5826	0.5666	0.5636	0.5497	0.5497	0.5471	0.5550	0.5636	0.5697	0.5760 (25)

3. Heat losses and heat loss parameter

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Element				Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K			
Main dwelling													
TER Opening Type						21.3800	1.1450	24.4809			(27)		
External Wall 1				60.0000	21.3800	38.6200	0.1800	6.9516			(29a)		
Total net area of external elements Aum(A, m2)						60.0000					(31)		
Fabric heat loss, W/K = Sum (A x U)						(26)...(30) + (32) =		31.4325			(33)		
Main dwelling													
Party Wall hall						39.0000	0.0000	0.0000			(32)		
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K										204.9392	(35)		
List of Thermal Bridges													
K1 Element							Length	Psi-value		Total			
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)							31.0000	0.0000		0.0000			
E7 Party floor between dwellings (in blocks of flats)							48.0000	0.0700		3.3600			
E1 Steel lintel with perforated steel base plate							9.9200	0.0500		0.4960			
E3 Sill							9.9200	0.0500		0.4960			
E4 Jamb							31.3600	0.0500		1.5680			
E16 Corner (normal)							5.0000	0.0900		0.4500			
E18 Party wall between dwellings							5.0000	0.0600		0.3000			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											6.6700 (36)		
Point Thermal bridges										(36a) =	0.0000		
Total fabric heat loss									(33) + (36) + (36a) =		38.1025 (37)		
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(38)
	41.5806	41.3355	41.0953	39.9669	39.7557	38.7729	38.7729	38.5909	39.1515	39.7557	40.1828	40.6294	
Heat transfer coeff	79.6831	79.4380	79.1978	78.0694	77.8583	76.8754	76.8754	76.6934	77.2540	77.8583	78.2854	78.7319	(39)
Average = Sum(39)m / 12 =												78.0684	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(40)
HLP (average)	0.9320	0.9291	0.9263	0.9131	0.9106	0.8991	0.8991	0.8970	0.9036	0.9106	0.9156	0.9208	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)													

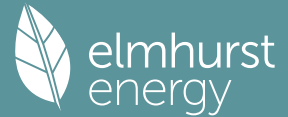
Assumed occupancy												2.5590 (42)	
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)	
Hot water usage for baths													
	77.4084	76.2588	74.6399	71.6549	69.4198	66.9414	65.6027	67.2103	68.9606	71.6126	74.6590	77.1467 (42b)	
Hot water usage for other uses													
	40.8366	39.3516	37.8666	36.3817	34.8967	33.4117	33.4117	34.8967	36.3817	37.8666	39.3516	40.8366 (42c)	
Average daily hot water use (litres/day)												108.8939 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	118.2450	115.6104	112.5065	108.0366	104.3165	100.3531	99.0144	102.1070	105.3423	109.4792	114.0106	117.9833 (44)	
Energy conte	187.2711	164.6276	172.9183	147.8966	140.4300	123.3959	119.7493	126.4297	129.8976	148.5623	162.4291	184.7333 (45)	
Energy content (annual)												Total = Sum(45)m = 1808.3409	
Distribution loss (46)m = 0.15 x (45)m													
	28.0907	24.6941	25.9377	22.1845	21.0645	18.5094	17.9624	18.9645	19.4846	22.2843	24.3644	27.7100 (46)	
Water storage loss (or HIU loss):													
Store volume												15.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												0.4337 (48)	
Temperature factor from Table 2b												0.5400 (49)	
Enter (49) or (54) in (55)												0.2342 (55)	
Total storage loss													
	7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595 (56)	
If cylinder contains dedicated solar storage													
	7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595 (57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624 (59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	
Total heat required for water heating calculated for each month													
	217.7930	192.1958	203.4402	177.4340	170.9519	152.9332	150.2713	156.9517	159.4349	179.0842	191.9664	215.2552 (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	217.7930	192.1958	203.4402	177.4340	170.9519	152.9332	150.2713	156.9517	159.4349	179.0842	191.9664	215.2552 (64)	
												Total per year (kWh/year) = Sum(64)m = 2167.7120 (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	86.6852	76.7932	81.9129	72.8055	71.1105	64.6590	64.2342	66.4554	66.8208	73.8145	77.6375	85.8414 (65)	

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	116.2866	128.7459	116.2866	120.1629	116.2866	120.1629	116.2866	116.2866	120.1629	116.2866	120.1629	116.2866 (67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	230.5513	232.9437	226.9149	214.0803	197.8790	182.6521	172.4796	170.0872	176.1159	188.9505	205.1518	220.3787 (68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949 (69)	
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)	
Losses e.g. evaporation (negative values) (Table 5)													
	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594 (71)	
Water heating gains (Table 5)													
	116.5124	114.2757	110.0980	101.1188	95.5787	89.8042	86.3363	89.3218	92.8067	99.2130	107.8299	115.3782 (72)	
Total internal gains	527.7350	540.3500	517.6843	499.7468	474.1291	454.0039	436.4873	437.0804	450.4703	468.8349	497.5294	516.4283 (73)	

6. Solar gains													

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[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF Access factor Table 6d	Gains W
Northeast	8.7300	11.2829	0.6300	0.7000	0.7700	30.1029 (75)
Southeast	4.8900	36.7938	0.6300	0.7000	0.7700	54.9865 (77)
Northwest	7.7600	11.2829	0.6300	0.7000	0.7700	26.7581 (81)

Solar gains	111.8475	209.4046	336.6836	501.2550	638.1988	667.3440	629.3413	522.0138	392.8604	244.9630	137.4070	93.4925 (83)
Total gains	639.5825	749.7546	854.3679	1001.0018	1112.3279	1121.3479	1065.8286	959.0942	843.3307	713.7980	634.9364	609.9209 (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	61.0833	61.2717	61.4576	62.3459	62.5150	63.3142	63.3142	63.4644	63.0039	62.5150	62.1739	61.8213
alpha	5.0722	5.0848	5.0972	5.1564	5.1677	5.2209	5.2209	5.2310	5.2003	5.1677	5.1449	5.1214
util living area	0.9872	0.9715	0.9321	0.8124	0.6244	0.4354	0.3168	0.3666	0.6094	0.8858	0.9730	0.9897 (86)
MIT	19.9279	20.1554	20.4597	20.7976	20.9544	20.9942	20.9991	20.9982	20.9704	20.7266	20.2762	19.8949 (87)
Th 2	20.1404	20.1428	20.1452	20.1564	20.1585	20.1682	20.1682	20.1701	20.1645	20.1585	20.1542	20.1498 (88)
util rest of house	0.9841	0.9648	0.9170	0.7786	0.5753	0.3802	0.2572	0.3011	0.5436	0.8548	0.9654	0.9871 (89)
MIT 2	18.8955	19.1832	19.5597	19.9600	20.1216	20.1648	20.1679	20.1693	20.1446	19.8935	19.3467	18.8606 (90)
Living area fraction										fLA = Living area / (4) =		0.2140 (91)
MIT	19.1165	19.3913	19.7523	20.1393	20.2999	20.3423	20.3458	20.3467	20.3213	20.0718	19.5457	19.0820 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1165	19.3913	19.7523	20.1393	20.2999	20.3423	20.3458	20.3467	20.3213	20.0718	19.5457	19.0820 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9790	0.9575	0.9088	0.7778	0.5838	0.3918	0.2700	0.3151	0.5563	0.8512	0.9585	0.9828 (94)
Useful gains	626.1750	717.8613	776.4884	778.6203	649.3424	439.3770	287.7342	302.1887	469.1677	607.5931	608.6117	599.4023 (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	1180.6214	1151.1604	1049.5557	877.4416	669.5724	441.4429	287.9608	302.6860	480.6227	737.4616	974.3147	1171.6873 (97)
Space heating kWh	412.5081	291.1770	203.1620	71.1513	15.0511	0.0000	0.0000	0.0000	0.0000	96.6221	263.3061	425.7800 (98a)
Space heating requirement - total per year (kWh/year)												1778.7580
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	412.5081	291.1770	203.1620	71.1513	15.0511	0.0000	0.0000	0.0000	0.0000	96.6221	263.3061	425.7800 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1778.7580
Space heating per m2										(98c) / (4) =		20.8042 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Fraction of main heating from main system 2												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												88.8000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	412.5081	291.1770	203.1620	71.1513	15.0511	0.0000	0.0000	0.0000	0.0000	96.6221	263.3061	425.7800 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	446.9211	315.4681	220.1105	77.0870	16.3068	0.0000	0.0000	0.0000	0.0000	104.6827	285.2721	461.3001 (211)
Space heating efficiency (main heating system 2)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Space heating fuel used, main system 2												0.0000 (213)
Water heating												
Water heating requirement	217.7930	192.1958	203.4402	177.4340	170.9519	152.9332	150.2713	156.9517	159.4349	179.0842	191.9664	215.2552 (64)
Efficiency of water heater	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000 (216)
Fuel for water heating, kWh/month	272.9236	240.8469	254.9376	222.3484	214.2255	191.6456	188.3099	196.6813	199.7931	224.4163	240.5594	269.7434 (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	11.1260	10.0493	11.1260	10.7671	11.1260	10.7671	11.1260	11.1260	10.7671	11.1260	10.7671	11.1260 (231)
Lighting	24.1621	19.3837	17.4529	12.7867	9.8768	8.0695	9.0100	11.7115	15.2121	19.9591	22.5438	24.8336 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-10.2542	-15.8292	-24.8861	-30.6903	-35.5620	-34.1162	-33.7044	-30.5685	-25.5264	-19.2274	-11.7499	-8.7129 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-2.2647	-4.9562	-10.2235	-15.9245	-21.6319	-21.9490	-21.6901	-18.0962	-12.9194	-7.2663	-3.0788	-1.7769 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												

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(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1927.1484	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2716.4310	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												131.0000	(231)
Electricity for lighting (calculated in Appendix L)												195.0017	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-422.6052	(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												4546.9760	(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	1927.1484	0.2100	404.7012	(261)
Space heating - main system 2	0.0000	0.2100	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2716.4310	0.2100	570.4505	(264)
Space and water heating			975.1517	(265)
Pumps, fans and electric keep-hot	131.0000	0.1387	18.1713	(267)
Energy for lighting	195.0017	0.1443	28.1448	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-280.8275	0.1327	-37.2770	
PV Unit electricity exported	-141.7776	0.1248	-17.7009	
Total			-54.9779	(269)
Total CO2, kg/year			966.4899	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.3000	(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	1927.1484	1.1300	2177.6777	(275)
Space heating - main system 2	0.0000	1.1300	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2716.4310	1.1300	3069.5671	(278)
Space and water heating			5247.2448	(279)
Pumps, fans and electric keep-hot	131.0000	1.5128	198.1768	(281)
Energy for lighting	195.0017	1.5338	299.1001	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-280.8275	1.4905	-418.5670	
PV Unit electricity exported	-141.7776	0.4582	-64.9673	
Total			-483.5343	(283)
Total Primary energy kWh/year			5260.9874	(286)
Target Primary Energy Rate (TPER)			61.5300	(287)

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Plot Reference	05flr sample 1 Plot 12				Issued on Date	13/12/2025	
Assessment Reference	Block B 1B2P			Plot Type Ref	Block B 1B2P		
Plot Address					SAP Version	10.2	
SAP Rating	87 B		DER	1.30		TER	13.64
Environmental	99 A		% DER < TER				90.47
CO ₂ Emissions (t/year)	0.06		DFEE	22.39		TFEE	25.23
Compliance Check	See BREL		% DFEE < TFEE				11.25
% DPER < TPER	82.06		DPER	13.47		TPER	75.09
Assessor Details	Mr. Andrew Jones				Assessor ID	N955-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	50.0000 (1b)	2.5000 (2b)	125.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	125.0000 (5)

2. Ventilation rate

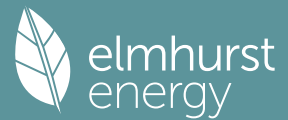
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1162 (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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												86.4000 (23c)
Effective ac	0.2162	0.2133	0.2104	0.1959	0.1930	0.1784	0.1784	0.1755	0.1842	0.1930	0.1988	0.2046 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows Open			7.6300	1.1450	8.7366		(27)
External Wall 1	16.2500	7.6300	8.6200	0.1500	1.2930	70.0000	603.4000 (29a)
External Roof 1	50.0000		50.0000	0.1100	5.5000	9.0000	450.0000 (30)
Total net area of external elements A _{um} (A, m ²)			66.2500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.5296		(33)
Main dwelling							
Party Wall hall			61.2500	0.0000	0.0000	180.0000	11025.0000 (32)
Party Floor 1			50.0000			40.0000	2000.0000 (32d)
Internal Wall 1			99.8500			9.0000	898.6500 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	14977.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							299.5410 (35)
Thermal bridges (User defined value 0.075 * total exposed area)							4.9688 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	20.4984 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	8.9190	8.7991	8.6793	8.0798	7.9600	7.3605	7.3605	7.2407	7.6003	7.9600	8.1997	8.4395	(38)
Heat transfer coeff	29.4174	29.2975	29.1776	28.5782	28.4584	27.8589	27.8589	27.7391	28.0987	28.4584	28.6981	28.9379	(39)
Average = Sum(39)m / 12 =												28.5483	
HLP	0.5883	0.5860	0.5836	0.5716	0.5692	0.5572	0.5572	0.5548	0.5620	0.5692	0.5740	0.5788	(40)
HLP (average)												0.5710	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6901 (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	60.5412	59.6421	58.3759	56.0413	54.2933	52.3549	51.3079	52.5652	53.9342	56.0083	58.3909	60.3365	(42b)
Hot water usage for other uses	31.9383	30.7769	29.6155	28.4541	27.2927	26.1314	26.1314	27.2927	28.4541	29.6155	30.7769	31.9383	(42c)
Average daily hot water use (litres/day)												85.1660	(43)
Daily hot water use	92.4795	90.4190	87.9914	84.4955	81.5860	78.4863	77.4393	79.8580	82.3883	85.6238	89.1678	92.2748	(44)
Energy conte	146.4649	128.7554	135.2396	115.6701	109.8304	96.5080	93.6561	98.8808	101.5930	116.1907	127.0359	144.4801	(45)
Energy content (annual)										Total = Sum(45)m =		1414.3051	
Distribution loss (46)m = 0.15 x (45)m	21.9697	19.3133	20.2859	17.3505	16.4746	14.4762	14.0484	14.8321	15.2390	17.4286	19.0554	21.6720	(46)
Water storage loss (or HIU loss):													
Store volume												15.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2500	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.1500	(55)
Total storage loss	4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500	(56)
If cylinder contains dedicated solar storage	4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	174.3773	153.9666	163.1520	142.6821	137.7428	123.5200	121.5685	126.7932	128.6050	144.1031	154.0479	172.3925	(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	174.3773	153.9666	163.1520	142.6821	137.7428	123.5200	121.5685	126.7932	128.6050	144.1031	154.0479	172.3925	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1742.9511	(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	71.0295	62.9801	67.2971	60.0699	58.8485	53.6985	53.4706	55.2078	55.3893	60.9633	63.8490	70.3695	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.8689	89.5335	80.8689	83.5646	80.8689	83.5646	80.8689	80.8689	83.5646	80.8689	83.5646	80.8689	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.2339	148.7618	144.9117	136.7153	126.3689	116.6447	110.1484	108.6205	112.4706	120.6670	131.0134	140.7376	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	(71)
Water heating gains (Table 5)	95.4698	93.7204	90.4531	83.4304	79.0975	74.5813	71.8690	74.2040	76.9296	81.9400	88.6792	94.5827	(72)
Total internal gains	371.9241	380.3672	364.5852	352.0618	334.6869	323.1421	311.2379	312.0450	321.3162	331.8274	351.6087	364.5408	(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		

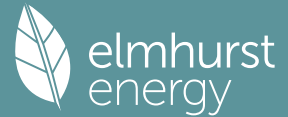
Southeast					7.6300	36.7938		0.4000		0.6000		0.7700		46.6922 (77)	

Solar gains	46.6922	79.5340	108.8219	134.8357	151.0272	149.9350	144.5534	132.4738	117.8311	87.9021	55.9265	39.9588	(83)		
Total gains	418.6163	459.9012	473.4071	486.8975	485.7140	473.0771	455.7912	444.5188	439.1474	419.7294	407.5352	404.4995	(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	141.4227	142.0014	142.5849	145.5755	146.1888	149.3342	149.3342	149.9796	148.0599	146.1888	144.9674	143.7663	
alpha	10.4282	10.4668	10.5057	10.7050	10.7459	10.9556	10.9556	10.9986	10.8707	10.7459	10.6645	10.5844	
util living area	0.9668	0.9239	0.8535	0.7048	0.5445	0.3769	0.2689	0.2871	0.4415	0.7002	0.9042	0.9728	(86)

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MIT	20.8240	20.9048	20.9613	20.9947	20.9996	21.0000	21.0000	21.0000	21.0000	20.9958	20.9380	20.8113 (87)
Th 2	20.4405	20.4427	20.4448	20.4557	20.4578	20.4687	20.4687	20.4709	20.4643	20.4578	20.4535	20.4492 (88)
util rest of house	0.9583	0.9082	0.8296	0.6748	0.5129	0.3456	0.2365	0.2540	0.4072	0.6654	0.8835	0.9656 (89)
MIT 2	20.2907	20.3660	20.4161	20.4522	20.4576	20.4687	20.4687	20.4709	20.4643	20.4553	20.4063	20.2869 (90)
Living area fraction									fLA = Living area / (4) =			0.4480 (91)
MIT	20.5296	20.6074	20.6603	20.6952	20.7005	20.7067	20.7067	20.7079	20.7043	20.6974	20.6445	20.5218 (92)
Temperature adjustment												0.0000
adjusted MIT	20.5296	20.6074	20.6603	20.6952	20.7005	20.7067	20.7067	20.7079	20.7043	20.6974	20.6445	20.5218 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9598	0.9131	0.8392	0.6881	0.5271	0.3596	0.2510	0.2688	0.4226	0.6809	0.8910	0.9666	(94)
Useful gains	401.7766	419.9244	397.2598	335.0349	256.0131	170.1251	114.4088	119.4975	185.5630	285.7926	363.1316	390.9986	(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	477.4339	460.1876	413.1651	337.0871	256.1381	170.1266	114.4088	119.4976	185.5722	287.3562	388.7007	472.3194	(97)
Space heating kWh	56.2890	27.0569	11.8335	1.4776	0.0930	0.0000	0.0000	0.0000	0.0000	1.1633	18.4097	60.5027	(98a)
Space heating requirement - total per year (kWh/year)												176.8257	
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	56.2890	27.0569	11.8335	1.4776	0.0930	0.0000	0.0000	0.0000	0.0000	1.1633	18.4097	60.5027	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												176.8257	
Space heating per m2										(98c) / (4) =		3.5365	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space												1.0000	(303a)
Fraction of heat from community Heat pump-Water												1.0000	(303b)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500	(305)
Distribution loss factor (Table 12c) for community heating system												1.0000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	56.2890	27.0569	11.8335	1.4776	0.0930	0.0000	0.0000	0.0000	0.0000	1.1633	18.4097	60.5027	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00													
307a	59.1035	28.4097	12.4252	1.5514	0.0976	0.0000	0.0000	0.0000	0.0000	1.2215	19.3302	63.5278	
Space heating requirement	59.1035	28.4097	12.4252	1.5514	0.0976	0.0000	0.0000	0.0000	0.0000	1.2215	19.3302	63.5278	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	174.3773	153.9666	163.1520	142.6821	137.7428	123.5200	121.5685	126.7932	128.6050	144.1031	154.0479	172.3925	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00													
310b	174.3773	153.9666	163.1520	142.6821	137.7428	123.5200	121.5685	126.7932	128.6050	144.1031	154.0479	172.3925	
Water heating fuel	174.3773	153.9666	163.1520	142.6821	137.7428	123.5200	121.5685	126.7932	128.6050	144.1031	154.0479	172.3925	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	9.7140	8.7740	9.7140	9.4007	9.7140	9.4007	9.7140	9.4007	9.7140	9.7140	9.4007	9.7140	(331)
Lighting	17.9462	14.3971	12.9630	9.4973	7.3360	5.9935	6.6921	8.6987	11.2987	14.8245	16.7442	18.4450	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-11.4826	-17.3486	-26.7583	-32.3577	-36.9104	-35.2288	-34.8059	-31.8377	-26.9569	-20.8013	-13.0306	-9.7955	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												185.6670	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												1742.9511	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution (space)												1.8567	(313)
Electricity used for heat distribution (water)												1.7239	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)													
mechanical ventilation fans (SFP = 0.7500)												114.3750	(330a)
Total electricity for the above, kWh/year												114.3750	(331)
Electricity for lighting (calculated in Appendix L)												144.8364	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-297.3144	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												1890.5151	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
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Efficiency of heat source Heat pump			330.0000 (367)
Space heating from Heat pump	56.2627	0.1603	9.0167 (367)
Efficiency of heat source Heat pump			440.0000 (367)
Water heating from Heat pump	396.1252	0.0000	0.0000 (368)
Electrical energy for heat distribution (space & water)	1.8567	0.0000	2.7553 (372)
Overall CO2 factor for heat network (space)			0.0502 (386)
Overall CO2 factor for heat network (water)			0.0335 (386)
Total CO2 associated with community systems			67.6294 (373)
Space and water heating			67.6294 (376)
Pumps, fans and electric keep-hot	114.3750	0.1387	15.8652 (378)
Energy for lighting	144.8364	0.1443	20.9044 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-297.3144	0.1331	-39.5795
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-39.5795 (380)
Total CO2, kg/year			64.8194 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.3000 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			330.0000 (467a)
Space heating from Heat pump	56.2627	1.5931	89.6346 (467)
Efficiency of heat source Heat pump			440.0000 (467b)
Water heating from Heat pump	396.1252	0.0000	0.0000 (468)
Electrical energy for heat distribution (space & water)	1.8567	0.0000	29.4753 (472)
Overall CO2 factor for heat network (space)			0.4987 (486)
Overall CO2 factor for heat network (water)			0.3610 (486)
Total CO2 associated with community systems			721.7776 (473)
Space and water heating			721.7776 (476)
Pumps, fans and electric keep-hot	114.3750	1.5128	173.0265 (478)
Energy for lighting	144.8364	1.5338	222.1549 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-297.3144	1.4919	-443.5687
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-443.5687 (480)
Total Primary energy kWh/year			673.3903 (483)
Dwelling Primary energy Rate (DPER)			13.4700 (484)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	50.0000 (1b)	2.5000 (2b)	125.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	125.0000 (5)

2. Ventilation rate

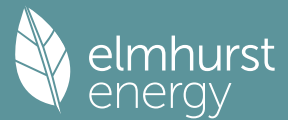
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1600 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4100 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (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	0.4051	0.3972	0.3892	0.3495	0.3416	0.3019	0.3019	0.2939	0.3178	0.3416	0.3575	0.3734 (22b)
Effective ac	0.5821	0.5789	0.5758	0.5611	0.5583	0.5456	0.5456	0.5432	0.5505	0.5583	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
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Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K
TER Opening Type			7.6300	1.1450	8.7366		(27)
External Wall 1	16.2500	7.6300	8.6200	0.1800	1.5516		(29a)
External Roof 1	50.0000		50.0000	0.1100	5.5000		(30)
Total net area of external elements Aum(A, m2)			66.2500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.7882		(33)
Main dwelling							
Party Wall hall		61.2500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 299.5410 (35)

List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				24.5000	0.0000	0.0000	
E7 Party floor between dwellings (in blocks of flats)				7.5000	0.0700	0.5250	
E15 Flat roof with parapet				7.5000	0.5600	4.2000	
P4 Party wall - Roof (insulation at ceiling level)				24.5000	0.1200	2.9400	
E1 Steel lintel with perforated steel base plate				3.6000	0.0500	0.1800	
E3 Sill				3.6000	0.0500	0.1800	
E4 Jamb				8.3000	0.0500	0.4150	
E18 Party wall between dwellings				10.0000	0.0600	0.6000	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.0400 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 24.8282 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	24.0102	23.8788	23.7499	23.1447	23.0315	22.5044	22.5044	22.4068	22.7074	23.0315	23.2605	23.5000
Average = Sum(39)m / 12 =	48.8384	48.7070	48.5781	47.9730	47.8597	47.3326	47.3326	47.2350	47.5356	47.8597	48.0888	48.3283

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9768	0.9741	0.9716	0.9595	0.9572	0.9467	0.9467	0.9447	0.9507	0.9572	0.9618	0.9666
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.6901 (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 60.5412 59.6421 58.3759 56.0413 54.2933 52.3549 51.3079 52.5652 53.9342 56.0083 58.3909 60.3365 (42b)

Hot water usage for other uses 31.9383 30.7769 29.6155 28.4541 27.2927 26.1314 26.1314 27.2927 28.4541 29.6155 30.7769 31.9383 (42c)

Average daily hot water use (litres/day) 85.1660 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	92.4795	90.4190	87.9914	84.4955	81.5860	78.4863	77.4393	79.8580	82.3883	85.6238	89.1678	92.2748
Energy content (annual)	146.4649	128.7554	135.2396	115.6701	109.8304	96.5080	93.6561	98.8808	101.5930	116.1907	127.0359	144.4801
Distribution loss (46)m = 0.15 x (45)m	21.9697	19.3133	20.2859	17.3505	16.4746	14.4762	14.0484	14.8321	15.2390	17.4286	19.0554	21.6720

Water storage loss (or HIU loss): 15.0000 (47)

Store volume 0.4337 (48)

a) If manufacturer declared loss factor is known (kWh/day): 0.5400 (49)

Enter (49) or (54) in (55) 0.2342 (55)

Total storage loss 7.2595 6.5570 7.2595 7.0253 7.2595 7.0253 7.2595 7.2595 7.0253 7.2595 7.0253 7.2595 (56)

If cylinder contains dedicated solar storage 7.2595 6.5570 7.2595 7.0253 7.2595 7.0253 7.2595 7.2595 7.0253 7.2595 7.0253 7.2595 (57)

Primary loss 23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 22.5120 23.2624 22.5120 23.2624 (59)

Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)

Total heat required for water heating calculated for each month 176.9868 156.3236 165.7615 145.2074 140.3524 126.0454 124.1780 129.4027 131.1304 146.7126 156.5733 175.0020 (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 176.9868 156.3236 165.7615 145.2074 140.3524 126.0454 124.1780 129.4027 131.1304 146.7126 156.5733 175.0020 (64)

Total per year (kWh/year) = Sum(64)m = 1773.6762 (64)

12Total per year (kWh/year) 1774 (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 73.1171 64.8657 69.3847 62.0902 60.9362 55.7188 55.5582 57.2954 57.4096 63.0509 65.8693 72.4572 (65)

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

Metabolic gains (Table 5), Watts

(66)m 84.5050 84.5050 84.5050 84.5050 84.5050 84.5050 84.5050 84.5050 84.5050 84.5050 84.5050 84.5050 (66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 78.2224 86.6033 78.2224 80.8298 78.2224 80.8298 78.2224 80.8298 78.2224 80.8298 78.2224 80.8298 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 147.2339 148.7618 144.9117 136.7153 126.3689 116.6447 110.1484 108.6205 112.4706 120.6670 131.0134 140.7376 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 31.4505 31.4505 31.4505 31.4505 31.4505 31.4505 31.4505 31.4505 31.4505 31.4505 31.4505 31.4505 (69)

Pumps, fans 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 (70)

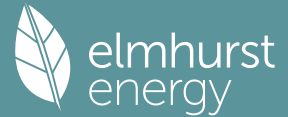
Losses e.g. evaporation (negative values) (Table 5) -67.6040 -67.6040 -67.6040 -67.6040 -67.6040 -67.6040 -67.6040 -67.6040 -67.6040 -67.6040 -67.6040 -67.6040 (71)

Water heating gains (Table 5) 98.2757 96.5264 93.2590 86.2364 81.9034 77.3872 74.6750 77.0100 79.7355 84.7459 91.4852 97.3887 (72)

Total internal gains 375.0835 383.2430 367.7446 355.1330 337.8462 323.2132 311.3972 312.2044 321.3874 334.9868 354.6799 367.7001 (73)

6. Solar gains

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[Jan]	Area m2				Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Southeast	7.6300				36.7938		0.6300		0.7000		0.7700		85.7969 (77)
Solar gains	85.7969	146.1438	199.9603	247.7605	277.5124	275.5056	265.6168	243.4205	216.5147	161.5200	102.7649	73.4242 (83)	
Total gains	460.8804	529.3868	567.7049	602.8935	615.3587	598.7188	577.0140	555.6249	537.9022	496.5068	457.4447	441.1244 (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	85.1848	85.4147	85.6412	86.7216	86.9268	87.8948	87.8948	88.0765	87.5194	86.9268	86.5127	86.0840	
alpha	6.6790	6.6943	6.7094	6.7814	6.7951	6.8597	6.8597	6.8718	6.8346	6.7951	6.7675	6.7389	
util living area	0.9903	0.9754	0.9437	0.8544	0.6992	0.5036	0.3607	0.3907	0.6015	0.8728	0.9744	0.9924 (86)	
MIT	20.3155	20.4894	20.6784	20.8751	20.9717	20.9973	20.9998	20.9996	20.9915	20.8769	20.5746	20.2859 (87)	
Th 2	20.1027	20.1049	20.1071	20.1173	20.1192	20.1280	20.1280	20.1297	20.1246	20.1192	20.1153	20.1113 (88)	
util rest of house	0.9869	0.9674	0.9264	0.8170	0.6416	0.4362	0.2894	0.3170	0.5290	0.8313	0.9647	0.9898 (89)	
MIT 2	19.3277	19.5461	19.7765	20.0055	20.0992	20.1268	20.1280	20.1296	20.1202	20.0141	19.6628	19.2973 (90)	
Living area fraction	fLA = Living area / (4) = 0.4480 (91)												
MIT	19.7703	19.9687	20.1805	20.3951	20.4901	20.5168	20.5185	20.5193	20.5105	20.4006	20.0713	19.7402 (92)	
Temperature adjustment	0.0000												
adjusted MIT	19.7703	19.9687	20.1805	20.3951	20.4901	20.5168	20.5185	20.5193	20.5105	20.4006	20.0713	19.7402 (93)	
8. Space heating requirement													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9853	0.9660	0.9280	0.8295	0.6664	0.4664	0.3213	0.3500	0.5614	0.8456	0.9641	0.9884 (94)	
Useful gains	454.1081	511.3685	526.8123	500.0982	410.1027	279.2421	185.4221	194.4835	301.9783	419.8529	441.0128	435.9968 (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	755.5437	733.9514	664.5741	551.4533	420.6906	280.0567	185.4744	194.5769	304.7278	469.0550	623.7738	751.0307 (97)	
Space heating kWh	224.2681	149.5757	102.4948	36.9757	7.8774	0.0000	0.0000	0.0000	0.0000	36.6064	131.5879	234.3853 (98a)	
Space heating requirement - total per year (kWh/year)	923.7712												
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	224.2681	149.5757	102.4948	36.9757	7.8774	0.0000	0.0000	0.0000	0.0000	36.6064	131.5879	234.3853 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)	923.7712												
Space heating per m2	(98c) / (4) = 18.4754 (99)												
9a. Energy requirements - Individual heating systems, including micro-CHP													
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)	
Fraction of space heat from main system(s)												1.0000 (202)	
Fraction of main heating from main system 2												0.0000 (203)	
Fraction of total heating from main system 1												1.0000 (204)	
Fraction of total heating from main system 2												0.0000 (205)	
Efficiency of main space heating system 1 (in %)												92.3000 (206)	
Efficiency of main space heating system 2 (in %)												88.8000 (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	224.2681	149.5757	102.4948	36.9757	7.8774	0.0000	0.0000	0.0000	0.0000	36.6064	131.5879	234.3853 (98)	
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)	
Space heating fuel (main heating system)	242.9773	162.0538	111.0453	40.0603	8.5346	0.0000	0.0000	0.0000	0.0000	39.6602	142.5654	253.9385 (211)	
Space heating efficiency (main heating system 2)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)	
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
Water heating													
Water heating requirement	176.9868	156.3236	165.7615	145.2074	140.3524	126.0454	124.1780	129.4027	131.1304	146.7126	156.5733	175.0020 (64)	
Efficiency of water heater (217)m	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000 (216)	
Fuel for water heating, kWh/month	221.7880	195.8943	207.7212	181.9642	175.8802	157.9516	155.6115	162.1588	164.3238	183.8504	196.2071	219.3008 (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	11.1260	10.0493	11.1260	10.7671	11.1260	10.7671	11.1260	11.1260	10.7671	11.1260	10.7671	11.1260 (231)	
Lighting	16.2531	13.0388	11.7400	8.6012	6.6438	5.4281	6.0607	7.8780	10.2327	13.4259	15.1645	16.7048 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-6.0761	-9.4243	-14.8889	-18.4595	-21.4878	-20.6621	-20.4254	-18.4851	-15.3695	-11.4983	-6.9811	-5.1589 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-1.2449	-2.7309	-5.6431	-8.8007	-11.9589	-12.1246	-11.9690	-9.9738	-7.1134	-3.9951	-1.6906	-0.9755 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

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(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1000.8356	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2222.6518	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												131.0000	(231)
Electricity for lighting (calculated in Appendix L)												131.1715	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-247.1375	(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												3238.5214	(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	1000.8356	0.2100	210.1755	(261)
Space heating - main system 2	0.0000	0.2100	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2222.6518	0.2100	466.7569	(264)
Space and water heating			676.9324	(265)
Pumps, fans and electric keep-hot	131.0000	0.1387	18.1713	(267)
Energy for lighting	131.1715	0.1443	18.9321	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-168.9170	0.1326	-22.4033	
PV Unit electricity exported	-78.2206	0.1248	-9.7652	
Total			-32.1685	(269)
Total CO2, kg/year			681.8673	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.6400	(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	1000.8356	1.1300	1130.9442	(275)
Space heating - main system 2	0.0000	1.1300	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2222.6518	1.1300	2511.5966	(278)
Space and water heating			3642.5407	(279)
Pumps, fans and electric keep-hot	131.0000	1.5128	198.1768	(281)
Energy for lighting	131.1715	1.5338	201.1953	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-168.9170	1.4901	-251.6966	
PV Unit electricity exported	-78.2206	0.4582	-35.8412	
Total			-287.5378	(283)
Total Primary energy kWh/year			3754.3750	(286)
Target Primary Energy Rate (TPER)			75.0900	(287)

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Plot Reference	05flr sample 2 Plot 13			Issued on Date	13/12/2025	
Assessment Reference	Block C 1 2B4P	Plot Type Ref	Block C 1 2B4P			
Plot Address				SAP Version	10.2	
SAP Rating	86 B	DER	1.67	TER	14.41	
Environmental	99 A	% DER < TER			88.41	
CO ₂ Emissions (t/year)	0.1	DFEE	31.92	TFEE	36.54	
Compliance Check	See BREL	% DFEE < TFEE			12.65	
% DPER < TPER	77.97	DPER	17.31	TPER	78.55	
Assessor Details	Mr. Andrew Jones			Assessor ID	N955-0001	
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.0000		
Dwelling volume			

2. Ventilation rate

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

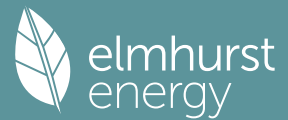
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												86.4000 (23c)
Effective ac	0.2306	0.2274	0.2242	0.2082	0.2051	0.1891	0.1891	0.1859	0.1955	0.2051	0.2114	0.2178 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows Open			13.0900	1.1450	14.9885		(27)
External Wall 1	45.0000	13.0900	31.9100	0.1500	4.7865	70.0000	2233.7000 (29a)
External Roof 1	72.0000		72.0000	0.1100	7.9200	9.0000	648.0000 (30)
Total net area of external elements A _{um} (A, m ²)			117.0000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.6950		(33)
Main dwelling							
Party Wall hall			45.0000	0.0000	0.0000	180.0000	8100.0000 (32)
Party Floor 1			72.0000			40.0000	2880.0000 (32d)
Internal Wall 1			123.8500			9.0000	1114.6500 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	14976.3500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							208.0049 (35)
Thermal bridges (User defined value 0.075 * total exposed area)							8.7750 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	36.4700 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	13.6954	13.5061	13.3167	12.3700	12.1807	11.2340	11.2340	11.0447	11.6127	12.1807	12.5594	12.9381	(38)
Heat transfer coeff	50.1655	49.9761	49.7868	48.8401	48.6508	47.7041	47.7041	47.5147	48.0827	48.6508	49.0294	49.4081	(39)
Average = Sum(39)m / 12 =												48.7928	
HLP	0.6967	0.6941	0.6915	0.6783	0.6757	0.6626	0.6626	0.6599	0.6678	0.6757	0.6810	0.6862	(40)
HLP (average)												0.6777	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2937 (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	72.2582	71.1851	69.6739	66.8875	64.8011	62.4876	61.2380	62.7386	64.3725	66.8480	69.6918	72.0139	(42b)
Hot water usage for other uses	38.1196	36.7335	35.3473	33.9611	32.5749	31.1888	31.1888	32.5749	33.9611	35.3473	36.7335	38.1196	(42c)
Average daily hot water use (litres/day)												101.6490	(43)
Daily hot water use	110.3779	107.9185	105.0212	100.8486	97.3760	93.6764	92.4267	95.3135	98.3336	102.1953	106.4252	110.1336	(44)
Energy conte	174.8115	153.6746	161.4136	138.0567	131.0869	115.1860	111.7821	118.0181	121.2552	138.6781	151.6223	172.4426	(45)
Energy content (annual)										Total = Sum(45)m =		1688.0277	
Distribution loss (46)m = 0.15 x (45)m	26.2217	23.0512	24.2120	20.7085	19.6630	17.2779	16.7673	17.7027	18.1883	20.8017	22.7433	25.8664	(46)
Water storage loss (or HIU loss):													
Store volume												15.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2500	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.1500	(55)
Total storage loss	4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500	(56)
If cylinder contains dedicated solar storage	4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	202.7239	178.8858	189.3260	165.0687	158.9993	142.1980	139.6945	145.9305	148.2672	166.5905	178.6343	200.3550	(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	202.7239	178.8858	189.3260	165.0687	158.9993	142.1980	139.6945	145.9305	148.2672	166.5905	178.6343	200.3550	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2016.6737	(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	80.4548	71.2658	76.0000	67.5135	65.9163	59.9090	59.4975	61.5709	61.9270	68.4404	72.0240	79.6671	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	106.8156	106.8156	106.8156	106.8156	106.8156	106.8156	106.8156	106.8156	106.8156	106.8156	106.8156	106.8156	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.9192	204.0145	198.7344	187.4938	173.3045	159.9686	151.0594	148.9641	154.2442	165.4848	179.6741	193.0100	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	(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)	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	(71)
Water heating gains (Table 5)	108.1381	106.0502	102.1505	93.7687	88.5972	83.2069	79.9697	82.7566	86.0097	91.9898	100.0333	107.0794	(72)
Total internal gains	474.2782	485.7301	465.1058	449.0439	426.1226	410.9569	395.2500	395.9416	408.0352	421.6954	447.4888	464.3103	(73)

6. Solar gains

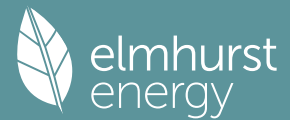
[Jan]												Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W		
-----														5.3900	36.7938	0.4000	0.6000	0.7700	32.9844 (79)	
Southwest												7.7000	11.2829	0.4000	0.6000	0.7700	14.4497 (81)			

Solar gains	47.4340	85.5973	129.8665	182.2795	223.6725	230.6342	218.7857	186.5931	147.8105	98.0406	57.6891	40.0281 (83)								
Total gains	521.7122	571.3274	594.9723	631.3234	649.7950	641.5911	614.0357	582.5347	555.8457	519.7360	505.1779	504.3383 (84)								

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	82.9275	83.2417	83.5583	85.1779	85.5094	87.2063	87.2063	87.5538	86.5195	85.5094	84.8490	84.1987	
alpha	6.5285	6.5494	6.5706	6.6785	6.7006	6.8138	6.8138	6.8369	6.7680	6.7006	6.6566	6.6132	
util living area													

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	0.9824	0.9667	0.9358	0.8393	0.6764	0.4743	0.3417	0.3749	0.5894	0.8582	0.9608	0.9851 (86)
MIT	20.3828	20.5210	20.6863	20.8836	20.9753	20.9981	20.9998	20.9997	20.9921	20.8857	20.6264	20.3662 (87)
Th 2	20.3437	20.3460	20.3484	20.3600	20.3623	20.3740	20.3740	20.3764	20.3693	20.3623	20.3577	20.3530 (88)
util rest of house												
	0.9784	0.9596	0.9226	0.8120	0.6356	0.4285	0.2932	0.3242	0.5383	0.8278	0.9513	0.9818 (89)
MIT 2	19.7851	19.9214	20.0814	20.2703	20.3463	20.3731	20.3740	20.3763	20.3651	20.2771	20.0350	19.7768 (90)
Living area fraction									FLA = Living area / (4) =			0.4333 (91)
MIT	20.0441	20.1812	20.3435	20.5360	20.6188	20.6439	20.6452	20.6464	20.6368	20.5408	20.2913	20.0322 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0441	20.1812	20.3435	20.5360	20.6188	20.6439	20.6452	20.6464	20.6368	20.5408	20.2913	20.0322 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9763	0.9576	0.9225	0.8198	0.6522	0.4483	0.3142	0.3462	0.5602	0.8368	0.9502	0.9798	(94)
Useful gains	509.3515	547.1095	548.8668	517.5755	423.8270	287.6354	192.9215	201.6730	311.3911	434.9020	480.0325	494.1449	(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	789.8119	763.6946	689.2235	568.3055	433.9085	288.3187	192.9712	201.7668	314.3076	483.6281	646.7621	782.2379	(97)
Space heating kWh	208.6626	145.5452	104.4254	36.5256	7.5006	0.0000	0.0000	0.0000	0.0000	36.2522	120.0453	214.3412	(98a)
Space heating requirement - total per year (kWh/year)												873.2980	
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	208.6626	145.5452	104.4254	36.5256	7.5006	0.0000	0.0000	0.0000	0.0000	36.2522	120.0453	214.3412	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												873.2980	
Space heating per m2										(98c) / (4) =		12.1291	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (301)
Fraction of space heat from community system													1.0000 (302)
Fraction of heat from community Heat pump-Space													1.0000 (303a)
Fraction of heat from community Heat pump-Water													1.0000 (303b)
Factor for control and charging method (Table 4c(3)) for space heating													1.0500 (305)
Distribution loss factor (Table 12c) for community heating system													1.0000 (306)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating:													
Space heating requirement	208.6626	145.5452	104.4254	36.5256	7.5006	0.0000	0.0000	0.0000	0.0000	36.2522	120.0453	214.3412	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00													
307a	219.0957	152.8224	109.6466	38.3519	7.8757	0.0000	0.0000	0.0000	0.0000	38.0648	126.0475	225.0583	
Space heating requirement	219.0957	152.8224	109.6466	38.3519	7.8757	0.0000	0.0000	0.0000	0.0000	38.0648	126.0475	225.0583	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)													0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	202.7239	178.8858	189.3260	165.0687	158.9993	142.1980	139.6945	145.9305	148.2672	166.5905	178.6343	200.3550	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00													
310b	202.7239	178.8858	189.3260	165.0687	158.9993	142.1980	139.6945	145.9305	148.2672	166.5905	178.6343	200.3550	
Water heating fuel	202.7239	178.8858	189.3260	165.0687	158.9993	142.1980	139.6945	145.9305	148.2672	166.5905	178.6343	200.3550	(310)
Cooling System Energy Efficiency Ratio	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	13.9882	12.6345	13.9882	13.5370	13.9882	13.5370	13.9882	13.9882	13.5370	13.9882	13.5370	13.9882	(331)
Lighting	23.7043	19.0164	17.1222	12.5445	9.6897	7.9166	8.8393	11.4896	14.9239	19.5809	22.1166	24.3631	(332)
Electricity generated by PVs (Appendix M) (negative quantity)	-11.9290	-18.2799	-28.5942	-35.0823	-40.4640	-38.7706	-38.2880	-34.7934	-29.1404	-22.1066	-13.6196	-10.1479	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												916.9629	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												2016.6737	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution (space)												9.1696	(313)
Electricity used for heat distribution (water)												2.0035	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)													
mechanical ventilation fans (SFP = 0.7500)												164.7000	(330a)
Total electricity for the above, kWh/year												164.7000	(331)
Electricity for lighting (calculated in Appendix L)												191.3070	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-321.2159	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												2968.4277	(338)

12b. Carbon dioxide emissions - Community heating scheme

Energy	Emission factor	Emissions
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	kWh/year	kg CO2/kWh	kg CO2/year
Efficiency of heat source Heat pump			330.0000 (367)
Space heating from Heat pump	277.8676	0.1574	43.7450 (367)
Efficiency of heat source Heat pump			440.0000 (367)
Water heating from Heat pump	458.3349	0.0000	0.0000 (368)
Electrical energy for heat distribution (space & water)	9.1696	0.0000	4.2887 (372)
Overall CO2 factor for heat network (space)			0.0493 (386)
Overall CO2 factor for heat network (water)			0.0335 (386)
Total CO2 associated with community systems			112.6965 (373)
Space and water heating			112.6965 (376)
Pumps, fans and electric keep-hot	164.7000	0.1387	22.8459 (378)
Energy for lighting	191.3070	0.1443	27.6115 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-321.2159	0.1329	-42.6737
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-42.6737 (380)
Total CO2, kg/year			120.4802 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.6700 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			330.0000 (467a)
Space heating from Heat pump	277.8676	1.5828	439.8115 (467)
Efficiency of heat source Heat pump			440.0000 (467b)
Water heating from Heat pump	458.3349	0.0000	0.0000 (468)
Electrical energy for heat distribution (space & water)	9.1696	0.0000	45.2011 (472)
Overall CO2 factor for heat network (space)			0.4955 (486)
Overall CO2 factor for heat network (water)			0.3611 (486)
Total CO2 associated with community systems			1182.4508 (473)
Space and water heating			1182.4508 (476)
Pumps, fans and electric keep-hot	164.7000	1.5128	249.1582 (478)
Energy for lighting	191.3070	1.5338	293.4331 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-321.2159	1.4909	-478.8987
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-478.8987 (480)
Total Primary energy kWh/year			1246.1434 (483)
Dwelling Primary energy Rate (DPER)			17.3100 (484)

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

1. Overall dwelling characteristics

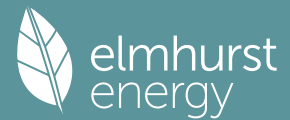
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	72.0000	2.5000	180.0000
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.0000		
Dwelling volume			

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	30.0000 / (5) = 0.1667 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4167 (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) = 0.3542 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000 (22)
Wind factor	1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 0.9500 0.9250 1.0000 1.0750 1.1250 1.1750 (22a)
Adj infilt rate	0.4516 0.4427 0.4339 0.3896 0.3807 0.3365 0.3365 0.3276 0.3542 0.3807 0.3984 0.4161 (22b)
Effective ac	0.6020 0.5980 0.5941 0.5759 0.5725 0.5566 0.5566 0.5537 0.5627 0.5725 0.5794 0.5866 (25)

3. Heat losses and heat loss parameter

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Element				Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K		
Main dwelling												
TER Opening Type						13.0900	1.1450	14.9885			(27)	
External Wall 1				45.0000	13.0900	31.9100	0.1800	5.7438			(29a)	
External Roof 1				72.0000		72.0000	0.1100	7.9200			(30)	
Total net area of external elements Aum(A, m2)						117.0000					(31)	
Fabric heat loss, W/K = Sum (A x U)						(26)...(30) + (32) =		28.6523			(33)	
Main dwelling												
Party Wall hall						45.0000	0.0000	0.0000			(32)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K											208.0049 (35)	
List of Thermal Bridges												
K1 Element							Length	Psi-value		Total		
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)							18.0000	0.0000		0.0000		
E7 Party floor between dwellings (in blocks of flats)							18.0000	0.0700		1.2600		
E15 Flat roof with parapet							18.0000	0.5600		10.0800		
P4 Party wall - Roof (insulation at ceiling level)							18.0000	0.1200		2.1600		
E1 Steel lintel with perforated steel base plate							6.5000	0.0500		0.3250		
E3 Sill							6.5000	0.0500		0.3250		
E4 Jamb							15.8000	0.0500		0.7900		
E16 Corner (normal)							2.5000	0.0900		0.2250		
E18 Party wall between dwellings							5.0000	0.0600		0.3000		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											15.4650 (36)	
Point Thermal bridges									(36a) =		0.0000	
Total fabric heat loss									(33) + (36) + (36a) =		44.1173 (37)	
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	35.7561	35.5209	35.2904	34.2077	34.0052	33.0622	33.0622	32.8875	33.4254	34.0052	34.4149	34.8434 (38)
Average = Sum(39)m / 12 =	79.8734	79.6383	79.4078	78.3251	78.1225	77.1795	77.1795	77.0049	77.5427	78.1225	78.5323	78.9607 (39)
												78.3241
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1094	1.1061	1.1029	1.0878	1.0850	1.0719	1.0719	1.0695	1.0770	1.0850	1.0907	1.0967 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

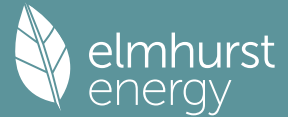
4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.2937 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths												72.2582 (42b)
Hot water usage for other uses												38.1196 (42c)
Average daily hot water use (litres/day)												101.6490 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	110.3779	107.9185	105.0212	100.8486	97.3760	93.6764	92.4267	95.3135	98.3336	102.1953	106.4252	110.1336 (44)
Energy content (annual)	174.8115	153.6746	161.4136	138.0567	131.0869	115.1860	111.7821	118.0181	121.2552	138.6781	151.6223	172.4426 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1688.0277
Water storage loss (or HIU loss):	26.2217	23.0512	24.2120	20.7085	19.6630	17.2779	16.7673	17.7027	18.1883	20.8017	22.7433	25.8664 (46)
Store volume												15.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.4337 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.2342 (55)
Total storage loss	7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595 (56)
If cylinder contains dedicated solar storage	7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	205.3335	181.2428	191.9356	167.5941	161.6088	144.7234	142.3041	148.5400	150.7925	169.2000	181.1596	202.9645 (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	205.3335	181.2428	191.9356	167.5941	161.6088	144.7234	142.3041	148.5400	150.7925	169.2000	181.1596	202.9645 (64)
12Total per year (kWh/year)												Total per year (kWh/year) = Sum(64)m = 2047.3988 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Heat gains from water heating, kWh/month	82.5424	73.1513	78.0876	69.5337	68.0039	61.9292	61.5851	63.6586	63.9472	70.5280	74.0443	81.7547 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	103.8566	114.9841	103.8566	107.3185	103.8566	107.3185	103.8566	103.8566	107.3185	103.8566	107.3185	103.8566 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	201.9192	204.0145	198.7344	187.4938	173.3045	159.9686	151.0594	148.9641	154.2442	165.4848	179.6741	193.0100 (68)
Pumps, fans	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684 (69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474 (71)
Total internal gains	110.9441	108.8562	104.9564	96.5746	91.4031	86.0128	82.7757	85.5626	88.8156	94.7957	102.8393	109.8853 (72)
	477.1251	488.2600	467.9527	451.7922	428.9695	410.7052	395.0969	395.7885	407.7835	424.5424	450.2371	467.1572 (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
Southwest	5.3900	36.7938	0.6300	0.7000	0.7700	60.6088 (79)
Northwest	7.7000	11.2829	0.6300	0.7000	0.7700	26.5512 (81)

Solar gains	87.1600	157.2850	238.6298	334.9386	410.9981	423.7904	402.0187	342.8648	271.6018	180.1496	106.0037	73.5516 (83)
Total gains	564.2851	645.5450	706.5825	786.7307	839.9676	834.4956	797.1157	738.6533	679.3853	604.6919	556.2408	540.7088 (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	52.0836	52.2374	52.3890	53.1132	53.2509	53.9016	53.9016	54.0238	53.6491	53.2509	52.9731	52.6857
alpha	4.4722	4.4825	4.4926	4.5409	4.5501	4.5934	4.5934	4.6016	4.5766	4.5501	4.5315	4.5124
util living area	0.9876	0.9765	0.9538	0.8867	0.7558	0.5690	0.4211	0.4709	0.7113	0.9172	0.9763	0.9896 (86)
MIT	19.6552	19.8706	20.1720	20.5648	20.8404	20.9666	20.9932	20.9889	20.9097	20.5512	20.0464	19.6258 (87)
Th 2	19.9932	19.9959	19.9985	20.0108	20.0131	20.0238	20.0238	20.0258	20.0197	20.0131	20.0084	20.0035 (88)
util rest of house	0.9843	0.9705	0.9417	0.8583	0.7016	0.4909	0.3301	0.3753	0.6346	0.8899	0.9691	0.9869 (89)
MIT 2	18.4422	18.7158	19.0940	19.5754	19.8788	20.0037	20.0213	20.0214	19.9573	19.5724	18.9496	18.4122 (90)
Living area fraction												0.4333 (91)
MIT	18.9678	19.2162	19.5611	20.0042	20.2955	20.4210	20.4425	20.4406	20.3700	19.9966	19.4249	18.9381 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9678	19.2162	19.5611	20.0042	20.2955	20.4210	20.4425	20.4406	20.3700	19.9966	19.4249	18.9381 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9799	0.9645	0.9353	0.8581	0.7180	0.5234	0.3695	0.4166	0.6636	0.8893	0.9637	0.9829 (94)
Useful gains	552.9281	622.6588	660.8735	675.0567	603.1251	436.8057	294.5678	307.7502	450.8197	537.7694	536.0758	531.4641 (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	1171.5691	1140.1173	1037.1548	869.7349	671.5018	449.2601	296.5598	311.1475	486.1947	734.0845	967.8999	1163.7309 (97)
Space heating kWh	460.2689	347.7321	279.9533	140.1683	50.8723	0.0000	0.0000	0.0000	0.0000	146.0585	310.9134	470.4065 (98a)
Space heating requirement - total per year (kWh/year)												2206.3732
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	460.2689	347.7321	279.9533	140.1683	50.8723	0.0000	0.0000	0.0000	0.0000	146.0585	310.9134	470.4065 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2206.3732
Space heating per m2										(98c) / (4) =		30.6441 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													92.3000 (206)
Efficiency of main space heating system 2 (in %)													88.8000 (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	460.2689	347.7321	279.9533	140.1683	50.8723	0.0000	0.0000	0.0000	0.0000	146.0585	310.9134	470.4065	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	498.6662	376.7411	303.3081	151.8617	55.1162	0.0000	0.0000	0.0000	0.0000	158.2432	336.8509	509.6495	(211)
Space heating efficiency (main heating system 2)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2													(213)
Water heating													
Water heating requirement	205.3335	181.2428	191.9356	167.5941	161.6088	144.7234	142.3041	148.5400	150.7925	169.2000	181.1596	202.9645	(64)
Efficiency of water heater	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	(216)
Fuel for water heating, kWh/month	257.3101	227.1213	240.5208	210.0176	202.5173	181.3576	178.3259	186.1404	188.9631	212.0301	227.0171	254.3415	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	11.1260	10.0493	11.1260	10.7671	11.1260	10.7671	11.1260	11.1260	10.7671	11.1260	10.7671	11.1260	(231)
Lighting	21.5794	17.3118	15.5873	11.4199	8.8211	7.2069	8.0469	10.4597	13.5861	17.8256	20.1340	22.1791	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-8.6801	-13.4245	-21.1455	-26.1303	-30.3295	-29.1199	-28.7736	-26.0749	-21.7391	-16.3327	-9.9563	-7.3731	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-1.8621	-4.0790	-8.4205	-13.1243	-17.8338	-18.0929	-17.8744	-14.9059	-10.6364	-5.9778	-2.5311	-1.4605	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

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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											2390.4368	(211)
Space heating fuel - main system 2											0.0000	(213)
Space heating fuel - secondary											0.0000	(215)
Efficiency of water heater											79.8000	
Water heating fuel used											2565.6626	(219)
Space cooling fuel											0.0000	(221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year											131.0000	(231)
Electricity for lighting (calculated in Appendix L)											174.1577	(232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation											-355.8780	(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											4905.3792	(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	2390.4368	0.2100	501.9917 (261)
Space heating - main system 2	0.0000	0.2100	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2565.6626	0.2100	538.7892 (264)
Space and water heating			1040.7809 (265)
Pumps, fans and electric keep-hot	131.0000	0.1387	18.1713 (267)
Energy for lighting	174.1577	0.1443	25.1363 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-239.0793	0.1327	-31.7254
PV Unit electricity exported	-116.7988	0.1248	-14.5811
Total			-46.3065 (269)
Total CO2, kg/year			1037.7820 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.4100 (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	2390.4368	1.1300	2701.1936 (275)
Space heating - main system 2	0.0000	1.1300	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2565.6626	1.1300	2899.1988 (278)
Space and water heating			5600.3924 (279)
Pumps, fans and electric keep-hot	131.0000	1.5128	198.1768 (281)
Energy for lighting	174.1577	1.5338	267.1289 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-239.0793	1.4903	-356.3049
PV Unit electricity exported	-116.7988	0.4582	-53.5167
Total			-409.8217 (283)
Total Primary energy kWh/year			5655.8765 (286)
Target Primary Energy Rate (TPER)			78.5500 (287)

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Plot Reference	05flr sample 3 Plot 14			Issued on Date	13/12/2025
Assessment Reference	Block D 3B5P	Plot Type Ref	Block D 3B5P		
Plot Address				SAP Version	10.2
SAP Rating	87 B	DER	1.63	TER	12.93
Environmental	99 A	% DER < TER			87.39
CO ₂ Emissions (t/year)	0.12	DFEE	31.19	TFEE	34.00
Compliance Check	See BREL	% DFEE < TFEE			8.25
% DPER < TPER	76.03	DPER	16.84	TPER	70.26
Assessor Details	Mr. Andrew Jones			Assessor ID	N955-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	86.0000 (1b)	2.5000 (2b)	215.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.0000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	215.0000 (5)

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	2	(19)

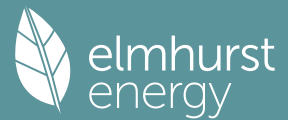
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (21)

	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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												85.5000 (23c)
Effective ac	0.2351	0.2319	0.2287	0.2128	0.2096	0.1936	0.1936	0.1904	0.2000	0.2096	0.2159	0.2223 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows Open			17.7400	1.1450	20.3130		(27)
External Wall 1	50.0000	17.7400	32.2600	0.1500	4.8390	70.0000	2258.2000 (29a)
External Roof 1	86.0000		86.0000	0.1100	9.4600	9.0000	774.0000 (30)
Total net area of external elements A _{um} (A, m ²)			136.0000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.6120		(33)
Main dwelling							
Party Wall hall			50.0000	0.0000	0.0000	180.0000	9000.0000 (32)
Party Floor 1			86.0000			40.0000	3440.0000 (32d)
Internal Wall 1			197.2500			9.0000	1775.2500 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	17247.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							200.5517 (35)
Thermal bridges (User defined value 0.075 * total exposed area)							10.2000 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	44.8120 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	16.6777	16.4515	16.2254	15.0946	14.8685	13.7377	13.7377	13.5115	14.1900	14.8685	15.3208	15.7731	(38)
Heat transfer coeff	61.4897	61.2635	61.0374	59.9066	59.6804	58.5497	58.5497	58.3235	59.0020	59.6804	60.1327	60.5850	(39)
Average = Sum(39)m / 12 =												59.8501	
HLP	0.7150	0.7124	0.7097	0.6966	0.6940	0.6808	0.6808	0.6782	0.6861	0.6940	0.6992	0.7045	(40)
HLP (average)												0.6959	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5669 (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	77.5624	76.4105	74.7883	71.7974	69.5579	67.0745	65.7332	67.3440	69.0978	71.7551	74.8076	77.3002	(42b)
Hot water usage for other uses	40.9178	39.4299	37.9420	36.4541	34.9661	33.4782	33.4782	34.9661	36.4541	37.9420	39.4299	40.9178	(42c)
Average daily hot water use (litres/day)												109.1106	(43)
Daily hot water use	118.4802	115.8404	112.7303	108.2515	104.5240	100.5528	99.2114	102.3101	105.5519	109.6970	114.2375	118.2180	(44)
Energy conte	187.6437	164.9551	173.2623	148.1909	140.7094	123.6413	119.9876	126.6813	130.1560	148.8578	162.7522	185.1008	(45)
Energy content (annual)										Total = Sum(45)m =		1811.9384	
Distribution loss (46)m = 0.15 x (45)m	28.1466	24.7433	25.9893	22.2286	21.1064	18.5462	17.9981	19.0022	19.5234	22.3287	24.4128	27.7651	(46)
Water storage loss (or HIU loss):													
Store volume												15.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2500	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.1500	(55)
Total storage loss	4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500	(56)
If cylinder contains dedicated solar storage	4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	215.5561	190.1663	201.1747	175.2029	168.6218	150.6533	147.9000	154.5937	157.1680	176.7702	189.7642	213.0132	(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	215.5561	190.1663	201.1747	175.2029	168.6218	150.6533	147.9000	154.5937	157.1680	176.7702	189.7642	213.0132	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2140.5844	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000	(64a)
Heat gains from water heating, kWh/month	84.7214	75.0165	79.9396	70.8831	69.1158	62.7203	62.2258	64.4514	64.8865	71.8251	75.7247	83.8759	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.6196	132.4359	119.6196	123.6069	119.6196	123.6069	119.6196	119.6196	123.6069	119.6196	123.6069	119.6196	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	231.5234	233.9259	227.8717	214.9831	198.7134	183.4223	173.2069	170.8044	176.8586	189.7472	206.0168	221.3080	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	(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)	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	(71)
Water heating gains (Table 5)	113.8729	111.6318	107.4457	98.4487	92.8976	87.1116	83.6368	86.6283	90.1201	96.5392	105.1732	112.7365	(72)
Total internal gains	526.5197	539.4974	516.4408	498.5424	472.7343	455.6445	437.9670	438.5560	452.0893	467.4097	496.3007	515.1678	(73)

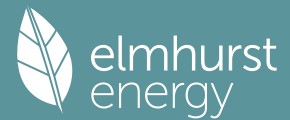
6. Solar gains

[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				5.9400	11.2829	0.4000	0.6000		0.7700		11.1469 (75)	
Southeast				11.8000	36.7938	0.4000	0.6000		0.7700		72.2107 (77)	
Solar gains	83.3576	145.6913	209.1758	275.6633	323.8120	328.0887	313.5583	276.6254	232.0417	163.6716	100.5174	70.9004 (83)
Total gains	609.8772	685.1887	725.6166	774.2057	796.5464	783.7332	751.5253	715.1813	684.1310	631.0813	596.8181	586.0682 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	77.9149	78.2025	78.4922	79.9738	80.2769	81.8272	81.8272	82.1445	81.2000	80.2769	79.6730	79.0782	
alpha	6.1943	6.2135	6.2328	6.3316	6.3518	6.4551	6.4551	6.4763	6.4133	6.3518	6.3115	6.2719	
util living area													

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	0.9835	0.9658	0.9315	0.8336	0.6739	0.4760	0.3426	0.3747	0.5863	0.8567	0.9627	0.9864 (86)
MIT	20.3036	20.4704	20.6585	20.8698	20.9701	20.9972	20.9997	20.9995	20.9901	20.8688	20.5723	20.2812 (87)
Th 2	20.3276	20.3299	20.3322	20.3438	20.3462	20.3578	20.3578	20.3601	20.3532	20.3462	20.3415	20.3369 (88)
util rest of house												
	0.9799	0.9587	0.9179	0.8059	0.6327	0.4291	0.2927	0.3228	0.5345	0.8263	0.9538	0.9834 (89)
MIT 2	19.6950	19.8593	20.0412	20.2429	20.3265	20.3564	20.3577	20.3600	20.3478	20.2476	19.9700	19.6809 (90)
Living area fraction									FLA = Living area / (4) =			0.2267 (91)
MIT	19.8330	19.9979	20.1812	20.3851	20.4724	20.5017	20.5033	20.5050	20.4934	20.3884	20.1065	19.8170 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8330	19.9979	20.1812	20.3851	20.4724	20.5017	20.5033	20.5050	20.4934	20.3884	20.1065	19.8170 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9766	0.9546	0.9144	0.8078	0.6408	0.4396	0.3040	0.3346	0.5459	0.8284	0.9501	0.9805	(94)
Useful gains	595.6166	654.0878	663.5159	625.3759	510.4628	344.5656	228.4633	239.2842	373.4603	522.8125	567.0319	574.6578	(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	955.1197	924.9491	835.0613	688.0317	523.5412	345.5453	228.5365	239.4174	377.2244	584.1775	782.1187	946.1556	(97)
Space heating kWh	267.4703	182.0188	127.6298	45.1122	9.7303	0.0000	0.0000	0.0000	0.0000	45.6555	154.8625	276.3943	(98a)
Space heating requirement - total per year (kWh/year)												1108.8737	
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	267.4703	182.0188	127.6298	45.1122	9.7303	0.0000	0.0000	0.0000	0.0000	45.6555	154.8625	276.3943	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1108.8737	
Space heating per m2										(98c) / (4) =		12.8939	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)
Fraction of space heat from community system												1.0000 (302)
Fraction of heat from community Heat pump-Space												1.0000 (303a)
Fraction of heat from community Heat pump-Water												1.0000 (303b)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500 (305)
Distribution loss factor (Table 12c) for community heating system												1.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	267.4703	182.0188	127.6298	45.1122	9.7303	0.0000	0.0000	0.0000	0.0000	45.6555	154.8625	276.3943 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00												
307a	280.8438	191.1198	134.0113	47.3678	10.2168	0.0000	0.0000	0.0000	0.0000	47.9383	162.6056	290.2140
Space heating requirement	280.8438	191.1198	134.0113	47.3678	10.2168	0.0000	0.0000	0.0000	0.0000	47.9383	162.6056	290.2140 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement	215.5561	190.1663	201.1747	175.2029	168.6218	150.6533	147.9000	154.5937	157.1680	176.7702	189.7642	213.0132 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00												
310b	215.5561	190.1663	201.1747	175.2029	168.6218	150.6533	147.9000	154.5937	157.1680	176.7702	189.7642	213.0132
Water heating fuel	215.5561	190.1663	201.1747	175.2029	168.6218	150.6533	147.9000	154.5937	157.1680	176.7702	189.7642	213.0132 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	14.7589	13.3306	14.7589	14.2828	14.7589	14.2828	14.7589	14.7589	14.2828	14.7589	14.2828	14.7589 (331)
Lighting	26.5457	21.2959	19.1746	14.0482	10.8512	8.8655	9.8988	12.8669	16.7128	21.9281	24.7677	27.2835 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-12.1005	-18.6413	-29.3130	-36.1581	-41.8745	-40.1766	-39.6669	-35.9580	-29.9953	-22.6129	-13.8460	-10.2828 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												1164.3174 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2140.5844 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution (space)												11.6432 (313)
Electricity used for heat distribution (water)												2.1301 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6625)												
mechanical ventilation fans (SFP = 0.6625)												173.7738 (330a)
Total electricity for the above, kWh/year												173.7738 (331)
Electricity for lighting (calculated in Appendix L)												214.2389 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-330.6260 (333)
Wind generation												0.0000 (334)
Hydro-electric generation (Appendix N)												0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (335)
Appendix Q - special features												
Energy saved or generated												-0.0000 (336)
Energy used												0.0000 (337)
Total delivered energy for all uses												3362.2885 (338)

12b. Carbon dioxide emissions - Community heating scheme

Energy	Emission factor	Emissions
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	kWh/year	kg CO2/kWh	kg CO2/year
Efficiency of heat source Heat pump			330.0000 (367)
Space heating from Heat pump	352.8234	0.1575	55.5638 (367)
Efficiency of heat source Heat pump			440.0000 (367)
Water heating from Heat pump	486.4965	0.0000	0.0000 (368)
Electrical energy for heat distribution (space & water)	11.6432	0.0000	4.8542 (372)
Overall CO2 factor for heat network (space)			0.0493 (386)
Overall CO2 factor for heat network (water)			0.0335 (386)
Total CO2 associated with community systems			129.0668 (373)
Space and water heating			129.0668 (376)
Pumps, fans and electric keep-hot	173.7738	0.1387	24.1046 (378)
Energy for lighting	214.2389	0.1443	30.9213 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-330.6260	0.1328	-43.8911
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-43.8911 (380)
Total CO2, kg/year			140.2015 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.6300 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			330.0000 (467a)
Space heating from Heat pump	352.8234	1.5830	558.5159 (467)
Efficiency of heat source Heat pump			440.0000 (467b)
Water heating from Heat pump	486.4965	0.0000	0.0000 (468)
Electrical energy for heat distribution (space & water)	11.6432	0.0000	51.0060 (472)
Overall CO2 factor for heat network (space)			0.4955 (486)
Overall CO2 factor for heat network (water)			0.3611 (486)
Total CO2 associated with community systems			1349.8616 (473)
Space and water heating			1349.8616 (476)
Pumps, fans and electric keep-hot	173.7738	1.5128	262.8849 (478)
Energy for lighting	214.2389	1.5338	328.6068 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-330.6260	1.4905	-492.8049
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-492.8049 (480)
Total Primary energy kWh/year			1448.5484 (483)
Dwelling Primary energy Rate (DPER)			16.8400 (484)

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

1. Overall dwelling characteristics

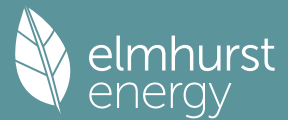
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	86.0000	2.5000	215.0000
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.0000		
Dwelling volume			

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1395 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3895 (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) = 0.3311 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000 (22)
Wind factor	1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 0.9500 0.9250 1.0000 1.0750 1.1250 1.1750 (22a)
Adj infilt rate	0.4222 0.4139 0.4056 0.3642 0.3559 0.3145 0.3145 0.3063 0.3311 0.3559 0.3725 0.3890 (22b)
Effective ac	0.5891 0.5856 0.5823 0.5663 0.5633 0.5495 0.5495 0.5469 0.5548 0.5633 0.5694 0.5757 (25)

3. Heat losses and heat loss parameter

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Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K					
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K					
TER Opening Type			17.7400	1.1450	20.3130		(27)					
External Wall 1	50.0000	17.7400	32.2600	0.1800	5.8068		(29a)					
External Roof 1	86.0000		86.0000	0.1100	9.4600		(30)					
Total net area of external elements Aum(A, m2)			136.0000				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.5798		(33)					
Main dwelling												
Party Wall hall			50.0000	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							200.5517 (35)					
List of Thermal Bridges												
K1 Element				Length	Psi-value	Total						
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				20.0000	0.0000	0.0000						
E7 Party floor between dwellings (in blocks of flats)				20.0000	0.0700	1.4000						
E15 Flat roof with parapet				20.0000	0.5600	11.2000						
P4 Party wall - Roof (insulation at ceiling level)				20.0000	0.1200	2.4000						
E1 Steel lintel with perforated steel base plate				9.0500	0.0500	0.4525						
E3 Sill				9.0500	0.0500	0.4525						
E4 Jamb				23.2000	0.0500	1.1600						
E16 Corner (normal)				2.5000	0.0900	0.2250						
E18 Party wall between dwellings				5.0000	0.0600	0.3000						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							17.5900 (36)					
Point Thermal bridges						(36a) =	0.0000					
Total fabric heat loss						(33) + (36) + (36a) =	53.1698 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	41.7973	41.5518	41.3111	40.1809	39.9694	38.9849	38.9849	38.8026	39.3641	39.9694	40.3972	40.8444 (38)
Average = Sum(39)m / 12 =	94.9671	94.7215	94.4809	93.3506	93.1392	92.1547	92.1547	91.9724	92.5339	93.1392	93.5670	94.0142 (39)
												93.3496
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1043	1.1014	1.0986	1.0855	1.0830	1.0716	1.0716	1.0694	1.0760	1.0830	1.0880	1.0932 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

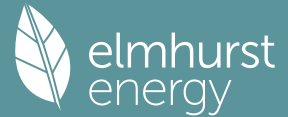
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5669 (42)
Hot water usage for mixer showers													
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for other uses	77.5624	76.4105	74.7883	71.7974	69.5579	67.0745	65.7332	67.3440	69.0978	71.7551	74.8076	77.3002	(42b)
Average daily hot water use (litres/day)	40.9178	39.4299	37.9420	36.4541	34.9661	33.4782	33.4782	34.9661	36.4541	37.9420	39.4299	40.9178	(42c)
													109.1106 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	118.4802	115.8404	112.7303	108.2515	104.5240	100.5528	99.2114	102.3101	105.5519	109.6970	114.2375	118.2180	(44)
Energy content (annual)	187.6437	164.9551	173.2623	148.1909	140.7094	123.6413	119.9876	126.6813	130.1560	148.8578	162.7522	185.1008	(45)
Distribution loss (46)m = 0.15 x (45)m													Total = Sum(45)m = 1811.9384
Water storage loss (or HIU loss):	28.1466	24.7433	25.9893	22.2286	21.1064	18.5462	17.9981	19.0022	19.5234	22.3287	24.4128	27.7651	(46)
Store volume													15.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													0.4337 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.2342 (55)
Total storage loss	7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595	(56)
If cylinder contains dedicated solar storage	7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	218.1656	192.5233	203.7842	177.7282	171.2313	153.1787	150.5095	157.2032	159.6934	179.3798	192.2895	215.6227	(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	218.1656	192.5233	203.7842	177.7282	171.2313	153.1787	150.5095	157.2032	159.6934	179.3798	192.2895	215.6227	(64)
12Total per year (kWh/year)													Total per year (kWh/year) = Sum(64)m = 2171.3095 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Heat gains from water heating, kWh/month	86.8091	76.9021	82.0273	72.9033	71.2034	64.7406	64.3134	66.5391	66.9068	73.9128	77.7450	85.9636	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	117.2582	129.8216	117.2582	121.1668	117.2582	121.1668	117.2582	117.2582	121.1668	117.2582	121.1668	117.2582	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	231.5234	233.9259	227.8717	214.9831	198.7134	183.4223	173.2069	170.8044	176.8586	189.7472	206.0168	221.3080	(68)
Pumps, fans	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	(69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Water heating gains (Table 5)	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	(71)
Total internal gains	116.6789	114.4377	110.2517	101.2546	95.7035	89.9175	86.4428	89.4342	92.9260	99.3451	107.9791	115.5424	(72)
	529.9643	542.6890	519.8854	501.9083	476.1789	456.0104	438.4116	439.0006	452.4552	470.8543	499.6666	518.6124	(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					5.9400	11.2829	0.6300	0.7000	0.7700		20.4824 (75)	
Southeast					11.8000	36.7938	0.6300	0.7000	0.7700		132.6871 (77)	
Solar gains	153.1695	267.7078	384.3606	506.5314	595.0046	602.8629	576.1633	508.2991	426.3766	300.7466	184.7008	130.2795 (83)
Total gains	683.1338	810.3968	904.2460	1008.4396	1071.1835	1058.8733	1014.5749	947.2997	878.8318	771.6009	684.3674	648.8919 (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	50.4486	50.5794	50.7082	51.3222	51.4387	51.9882	51.9882	52.0913	51.7752	51.4387	51.2035	50.9599
alpha	4.3632	4.3720	4.3805	4.4215	4.4292	4.4659	4.4659	4.4728	4.4517	4.4292	4.4136	4.3973
util living area	0.9854	0.9694	0.9383	0.8586	0.7204	0.5381	0.3956	0.4398	0.6684	0.8952	0.9713	0.9881 (86)
MIT	19.6379	19.8960	20.2208	20.6049	20.8583	20.9700	20.9939	20.9903	20.9233	20.5834	20.0477	19.5965 (87)
Th 2	19.9973	19.9997	20.0020	20.0127	20.0147	20.0241	20.0241	20.0259	20.0205	20.0147	20.0107	20.0064 (88)
util rest of house	0.9817	0.9620	0.9235	0.8269	0.6655	0.4632	0.3099	0.3499	0.5924	0.8639	0.9630	0.9851 (89)
MIT 2	18.4270	18.7531	19.1573	19.6214	19.8963	20.0060	20.0218	20.0219	19.9680	19.6102	18.9557	18.3810 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.7016	19.0122	19.3984	19.8444	20.1144	20.2246	20.2422	20.2415	20.1846	19.8309	19.2033	18.6566 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.7016	19.0122	19.3984	19.8444	20.1144	20.2246	20.2422	20.2415	20.1846	19.8309	19.2033	18.6566 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9752	0.9526	0.9127	0.8208	0.6714	0.4790	0.3292	0.3701	0.6059	0.8570	0.9542	0.9794 (94)
Useful gains	666.1856	772.0027	825.2619	827.7511	719.1822	507.2159	334.0390	350.6118	532.4610	661.2962	652.9899	635.5107 (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	1367.6777	1336.7310	1218.6540	1021.6697	783.7107	518.3321	335.6499	353.3134	563.0347	859.7542	1132.4724	1359.1260 (97)
Space heating kWh	521.9101	379.4974	292.6838	139.6214	48.0092	0.0000	0.0000	0.0000	0.0000	147.6527	345.2274	538.3698 (98a)
Space heating requirement - total per year (kWh/year)	2412.9718											
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	521.9101	379.4974	292.6838	139.6214	48.0092	0.0000	0.0000	0.0000	0.0000	147.6527	345.2274	538.3698 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2412.9718											
Space heating per m2	(98c) / (4) = 28.0578 (99)											

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)											
Fraction of space heat from main system(s)	1.0000 (202)											
Fraction of main heating from main system 2	0.0000 (203)											
Fraction of total heating from main system 1	1.0000 (204)											
Fraction of total heating from main system 2	0.0000 (205)											
Efficiency of main space heating system 1 (in %)	92.3000 (206)											
Efficiency of main space heating system 2 (in %)	88.8000 (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	521.9101	379.4974	292.6838	139.6214	48.0092	0.0000	0.0000	0.0000	0.0000	147.6527	345.2274	538.3698 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	565.4497	411.1565	317.1005	151.2691	52.0143	0.0000	0.0000	0.0000	0.0000	159.9705	374.0275	583.2825 (211)
Space heating efficiency (main heating system 2)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Space heating fuel used, main system 2	0.0000 (213)											
Water heating												
Water heating requirement	218.1656	192.5233	203.7842	177.7282	171.2313	153.1787	150.5095	157.2032	159.6934	179.3798	192.2895	215.6227 (64)
Efficiency of water heater	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000 (216)
Fuel for water heating, kWh/month	273.3905	241.2573	255.3687	222.7171	214.5756	191.9532	188.6084	196.9965	200.1170	224.7867	240.9643	270.2039 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	11.1260	10.0493	11.1260	10.7671	11.1260	10.7671	11.1260	11.1260	10.7671	11.1260	10.7671	11.1260 (231)
Lighting	24.3639	19.5457	17.5987	12.8936	9.9594	8.1369	9.0853	11.8094	15.3392	20.1259	22.7321	25.0411 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-10.3124	-15.9181	-25.0241	-30.8580	-35.7537	-34.2991	-33.8850	-30.7336	-25.6661	-19.3344	-11.8163	-8.7625 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-2.2797	-4.9889	-10.2909	-16.0295	-21.7746	-22.0939	-21.8334	-18.2157	-13.0045	-7.3142	-3.0991	-1.7886 (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)

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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												2614.2707	(211)	
Space heating fuel - main system 2												0.0000	(213)	
Space heating fuel - secondary												0.0000	(215)	
Efficiency of water heater												79.8000		
Water heating fuel used												2720.9392	(219)	
Space cooling fuel												0.0000	(221)	
Electricity for pumps and fans:														
Total electricity for the above, kWh/year												131.0000	(231)	
Electricity for lighting (calculated in Appendix L)												196.6309	(232)	
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation												-425.0765	(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												5237.7643	(238)	

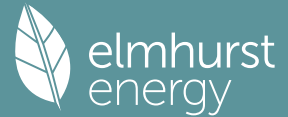
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2614.2707	0.2100	548.9968 (261)
Space heating - main system 2	0.0000	0.2100	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2720.9392	0.2100	571.3972 (264)
Space and water heating			1120.3941 (265)
Pumps, fans and electric keep-hot	131.0000	0.1387	18.1713 (267)
Energy for lighting	196.6309	0.1443	28.3799 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-282.3635	0.1327	-37.4813
PV Unit electricity exported	-142.7131	0.1248	-17.8177
Total			-55.2990 (269)
Total CO2, kg/year			1111.6463 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.9300 (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	2614.2707	1.1300	2954.1259 (275)
Space heating - main system 2	0.0000	1.1300	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2720.9392	1.1300	3074.6613 (278)
Space and water heating			6028.7872 (279)
Pumps, fans and electric keep-hot	131.0000	1.5128	198.1768 (281)
Energy for lighting	196.6309	1.5338	301.5991 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-282.3635	1.4905	-420.8579
PV Unit electricity exported	-142.7131	0.4582	-65.3959
Total			-486.2538 (283)
Total Primary energy kWh/year			6042.3093 (286)
Target Primary Energy Rate (TPER)			70.2600 (287)

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Plot Reference	05flr sample 4 Plot 15				Issued on Date	13/12/2025		
Assessment Reference	Block E 2B4P			Plot Type Ref	Block E 2B4P			
Plot Address					SAP Version	10.2		
SAP Rating	88 B		DER	1.22		TER	11.14	
Environmental	99 A		% DER < TER				89.05	
CO ₂ Emissions (t/year)	0.08		DFEE	21.20		TFEE	22.38	
Compliance Check	See BREL		% DFEE < TFEE				5.27	
% DPER < TPER	79.10		DPER	12.73		TPER	60.91	
Assessor Details	Mr. Andrew Jones				Assessor ID	N955-0001		
Client								

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	72.0000 (1b)	2.5000 (2b)	180.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	180.0000 (5)

2. Ventilation rate

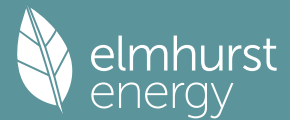
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												86.4000 (23c)
Effective ac	0.2306	0.2274	0.2242	0.2082	0.2051	0.1891	0.1891	0.1859	0.1955	0.2051	0.2114	0.2178 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows Open			13.9000	1.1450	15.9160		(27)
External Wall 1	42.5000	13.9000	28.6000	0.1500	4.2900	70.0000	2002.0000 (29a)
Total net area of external elements Aum(A, m ²)			42.5000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.2060		(33)
Main dwelling							
Party Wall hall			42.5000	0.0000	0.0000	180.0000	7650.0000 (32)
Party Floor 1			72.0000			40.0000	2880.0000 (32a)
Party Ceiling 1			72.0000			30.0000	2160.0000 (32b)
Internal Wall 1			144.2000			9.0000	1297.8000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	15989.8000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							222.0806 (35)
Thermal bridges (User defined value 0.075 * total exposed area)							3.1875 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	23.3935 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	13.6954	13.5061	13.3167	12.3700	12.1807	11.2340	11.2340	11.0447	11.6127	12.1807	12.5594	12.9381	(38)
Heat transfer coeff	37.0889	36.8996	36.7103	35.7636	35.5742	34.6276	34.6276	34.4382	35.0062	35.5742	35.9529	36.3316	(39)
Average = Sum(39)m / 12 =												35.7162	
HLP	0.5151	0.5125	0.5099	0.4967	0.4941	0.4809	0.4809	0.4783	0.4862	0.4941	0.4993	0.5046	(40)
HLP (average)												0.4961	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2937 (42)
Hot water usage for mixer showers													(42a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Hot water usage for baths													(42b)
72.2582	71.1851	69.6739	66.8875	64.8011	62.4876	61.2380	62.7386	64.3725	66.8480	69.6918	72.0139	72.0139	
Hot water usage for other uses													(42c)
38.1196	36.7335	35.3473	33.9611	32.5749	31.1888	31.1888	32.5749	33.9611	35.3473	36.7335	38.1196	38.1196	
Average daily hot water use (litres/day)												101.6490	(43)
Daily hot water use													
110.3779	107.9185	105.0212	100.8486	97.3760	93.6764	92.4267	95.3135	98.3336	102.1953	106.4252	110.1336	110.1336	(44)
Energy conte	174.8115	153.6746	161.4136	138.0567	131.0869	115.1860	111.7821	118.0181	121.2552	138.6781	151.6223	172.4426	(45)
Energy content (annual)												1688.0277	
Distribution loss (46)m = 0.15 x (45)m													
26.2217	23.0512	24.2120	20.7085	19.6630	17.2779	16.7673	17.7027	18.1883	20.8017	22.7433	25.8664	25.8664	(46)
Water storage loss (or HIU loss):													
Store volume												15.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2500	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.1500	(55)
Total storage loss													
4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.5000	4.6500	4.5000	4.6500	(56)
If cylinder contains dedicated solar storage													
4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
202.7239	178.8858	189.3260	165.0687	158.9993	142.1980	139.6945	145.9305	148.2672	166.5905	178.6343	200.3550	200.3550	(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													
202.7239	178.8858	189.3260	165.0687	158.9993	142.1980	139.6945	145.9305	148.2672	166.5905	178.6343	200.3550	200.3550	(64)
12Total per year (kWh/year)												2016.6737	(64)
Electric shower(s)												2017	(64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
80.4548	71.2658	76.0000	67.5135	65.9163	59.9090	59.4975	61.5709	61.9270	68.4404	72.0240	79.6671	79.6671	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
105.5644	116.8749	105.5644	109.0832	105.5644	109.0832	105.5644	105.5644	109.0832	105.5644	109.0832	105.5644	105.5644	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
201.9192	204.0145	198.7344	187.4938	173.3045	159.9686	151.0594	148.9641	154.2442	165.4848	179.6741	193.0100	193.0100	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	(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)													
-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	(71)
Water heating gains (Table 5)													
108.1381	106.0502	102.1505	93.7687	88.5972	83.2069	79.9697	82.7566	86.0097	91.9898	100.0333	107.0794	107.0794	(72)
Total internal gains													
473.0270	484.3449	463.8546	447.7510	424.8714	409.6640	393.9988	394.6904	406.7423	420.4442	446.1959	463.0591	463.0591	(73)

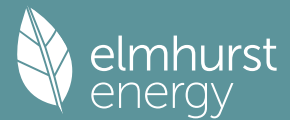
6. Solar gains

[Jan]												
					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
Southwest					5.9400	36.7938	0.4000	0.6000			0.7700	36.3501 (79)
Northwest					7.9600	11.2829	0.4000	0.6000			0.7700	14.9376 (81)
Solar gains	51.2877	92.3236	139.5002	194.9376	238.5092	245.6533	233.1452	199.2829	158.4846	105.5906	62.3344	43.3069 (83)
Total gains	524.3147	576.6684	603.3548	642.6886	663.3806	655.3173	627.1440	593.9734	565.2269	526.0349	508.5303	506.3660 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	119.7557	120.3702	120.9910	124.1937	124.8547	128.2681	128.2681	128.9733	126.8806	124.8547	123.5397	122.2520	
alpha	8.9837	9.0247	9.0661	9.2796	9.3236	9.5512	9.5512	9.5982	9.4587	9.3236	9.2360	9.1501	
util living area													

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	0.9576	0.9131	0.8357	0.6676	0.4983	0.3382	0.2429	0.2667	0.4273	0.6953	0.8943	0.9637 (86)
MIT	20.7806	20.8736	20.9474	20.9931	20.9995	21.0000	21.0000	21.0000	20.9999	20.9920	20.9156	20.7706 (87)
Th 2	20.5070	20.5094	20.5118	20.5238	20.5263	20.5383	20.5383	20.5408	20.5335	20.5263	20.5214	20.5166 (88)
util rest of house												
	0.9497	0.8997	0.8155	0.6428	0.4731	0.3138	0.2175	0.2401	0.3984	0.6658	0.8770	0.9568 (89)
MIT 2	20.3141	20.4025	20.4700	20.5190	20.5260	20.5383	20.5383	20.5408	20.5335	20.5209	20.4528	20.3135 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	20.4826	20.5726	20.6424	20.6902	20.6970	20.7050	20.7050	20.7066	20.7019	20.6910	20.6199	0.3611 (91)
Temperature adjustment												20.4786 (92)
adjusted MIT	20.4826	20.5726	20.6424	20.6902	20.6970	20.7050	20.7050	20.7066	20.7019	20.6910	20.6199	0.0000 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9493	0.9015	0.8210	0.6515	0.4822	0.3226	0.2267	0.2497	0.4088	0.6762	0.8807	0.9562 (94)	
Useful gains	497.7384	519.8798	495.3814	418.7171	319.8751	211.3998	142.1477	148.3112	231.0787	355.6824	447.8679	484.1918 (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	600.1944	578.3127	519.1705	421.6590	320.0605	211.4027	142.1478	148.3114	231.1077	358.9800	486.0802	591.4269 (97)	
Space heating kWh	76.2273	39.2669	17.6991	2.1182	0.1380	0.0000	0.0000	0.0000	0.0000	2.4534	27.5129	79.7829 (98a)	
Space heating requirement - total per year (kWh/year)												245.1985	
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	76.2273	39.2669	17.6991	2.1182	0.1380	0.0000	0.0000	0.0000	0.0000	2.4534	27.5129	79.7829 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												245.1985	
Space heating per m2										(98c) / (4) =		3.4055 (99)	

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (301)
Fraction of space heat from community system													1.0000 (302)
Fraction of heat from community Heat pump-Space													1.0000 (303a)
Fraction of heat from community Heat pump-Water													1.0000 (303b)
Factor for control and charging method (Table 4c(3)) for space heating													1.0500 (305)
Distribution loss factor (Table 12c) for community heating system													1.0000 (306)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating:													
Space heating requirement	76.2273	39.2669	17.6991	2.1182	0.1380	0.0000	0.0000	0.0000	0.0000	2.4534	27.5129	79.7829 (98)	
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00													
307a	80.0386	41.2303	18.5840	2.2241	0.1449	0.0000	0.0000	0.0000	0.0000	2.5761	28.8885	83.7720	
Space heating requirement	80.0386	41.2303	18.5840	2.2241	0.1449	0.0000	0.0000	0.0000	0.0000	2.5761	28.8885	83.7720 (307)	
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)	
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)	
Water heating													
Annual water heating requirement	202.7239	178.8858	189.3260	165.0687	158.9993	142.1980	139.6945	145.9305	148.2672	166.5905	178.6343	200.3550 (64)	
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00													
310b	202.7239	178.8858	189.3260	165.0687	158.9993	142.1980	139.6945	145.9305	148.2672	166.5905	178.6343	200.3550	
Water heating fuel	202.7239	178.8858	189.3260	165.0687	158.9993	142.1980	139.6945	145.9305	148.2672	166.5905	178.6343	200.3550 (310)	
Cooling System Energy Efficiency Ratio	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (314)	
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)	
Pumps and Fa	13.9882	12.6345	13.9882	13.5370	13.9882	13.5370	13.9882	13.9882	13.5370	13.9882	13.5370	13.9882 (331)	
Lighting	23.4266	18.7937	16.9216	12.3975	9.5762	7.8238	8.7357	11.3550	14.7491	19.3516	21.8576	24.0777 (332)	
Electricity generated by PVs (Appendix M) (negative quantity)	-11.9276	-18.2773	-28.5898	-35.0770	-40.4583	-38.7655	-38.2823	-34.7872	-29.1345	-22.1025	-13.6176	-10.1467 (333a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)	
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)	
Annual totals kWh/year													
Space heating fuel - community heating												257.4585 (307)	
Space heating fuel - secondary												0.0000 (309)	
Water heating fuel - community heating												2016.6737 (310)	
Efficiency of water heater												0.0000 (311)	
Electricity used for heat distribution (space)												2.5746 (313)	
Electricity used for heat distribution (water)												2.0035 (313)	
Space cooling fuel												0.0000 (321)	
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)													
mechanical ventilation fans (SFP = 0.7500)												164.7000 (330a)	
Total electricity for the above, kWh/year												164.7000 (331)	
Electricity for lighting (calculated in Appendix L)												189.0661 (332)	
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-321.1665 (333)	
Wind generation												0.0000 (334)	
Hydro-electric generation (Appendix N)												0.0000 (335a)	
Electricity generated - Micro CHP (Appendix N)												0.0000 (335)	
Appendix Q - special features													
Energy saved or generated												-0.0000 (336)	
Energy used												0.0000 (337)	
Total delivered energy for all uses												2306.7318 (338)	

12b. Carbon dioxide emissions - Community heating scheme

Energy	Emission factor	Emissions
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	kWh/year	kg CO2/kWh	kg CO2/year
Efficiency of heat source Heat pump			330.0000 (367)
Space heating from Heat pump	78.0177	0.1600	12.4821 (367)
Efficiency of heat source Heat pump			440.0000 (367)
Water heating from Heat pump	458.3349	0.0000	0.0000 (368)
Electrical energy for heat distribution (space & water)	2.5746	0.0000	3.2571 (372)
Overall CO2 factor for heat network (space)			0.0501 (386)
Overall CO2 factor for heat network (water)			0.0335 (386)
Total CO2 associated with community systems			80.4019 (373)
Space and water heating			80.4019 (376)
Pumps, fans and electric keep-hot	164.7000	0.1387	22.8459 (378)
Energy for lighting	189.0661	0.1443	27.2881 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-321.1665	0.1329	-42.6672
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-42.6672 (380)
Total CO2, kg/year			87.8687 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.2200 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			330.0000 (467a)
Space heating from Heat pump	78.0177	1.5922	124.2160 (467)
Efficiency of heat source Heat pump			440.0000 (467b)
Water heating from Heat pump	458.3349	0.0000	0.0000 (468)
Electrical energy for heat distribution (space & water)	2.5746	0.0000	34.7864 (472)
Overall CO2 factor for heat network (space)			0.4984 (486)
Overall CO2 factor for heat network (water)			0.3611 (486)
Total CO2 associated with community systems			856.4406 (473)
Space and water heating			856.4406 (476)
Pumps, fans and electric keep-hot	164.7000	1.5128	249.1582 (478)
Energy for lighting	189.0661	1.5338	289.9959 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-321.1665	1.4909	-478.8251
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-478.8251 (480)
Total Primary energy kWh/year			916.7696 (483)
Dwelling Primary energy Rate (DPER)			12.7300 (484)

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	72.0000	2.5000	180.0000
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.0000		
Dwelling volume			

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	30.0000 / (5) = 0.1667 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4167 (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) = 0.3542 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000 (22)
Wind factor	1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 0.9500 0.9250 1.0000 1.0750 1.1250 1.1750 (22a)
Adj infilt rate	0.4516 0.4427 0.4339 0.3896 0.3807 0.3365 0.3365 0.3276 0.3542 0.3807 0.3984 0.4161 (22b)
Effective ac	0.6020 0.5980 0.5941 0.5759 0.5725 0.5566 0.5566 0.5537 0.5627 0.5725 0.5794 0.5866 (25)

3. Heat losses and heat loss parameter

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Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
TER Opening Type			13.9000	1.1450	15.9160		(27)
External Wall 1	42.5000	13.9000	28.6000	0.1800	5.1480		(29a)
Total net area of external elements Aum(A, m ²)			42.5000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0640		(33)
Main dwelling							
Party Wall hall			42.5000	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 222.0806 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	34.0000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	34.0000	0.0700	2.3800
E1 Steel lintel with perforated steel base plate	6.5000	0.0500	0.3250
E3 Sill	6.5000	0.0500	0.3250
E4 Jamb	15.8000	0.0500	0.7900
E16 Corner (normal)	5.0000	0.0900	0.4500
E18 Party wall between dwellings	5.0000	0.0600	0.3000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			4.5700 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	25.6340 (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	35.7561	35.5209	35.2904	34.2077	34.0052	33.0622	33.0622	32.8875	33.4254	34.0052	34.4149	34.8434 (38)
Heat transfer coeff	61.3901	61.1550	60.9244	59.8418	59.6392	58.6962	58.6962	58.5216	59.0594	59.6392	60.0490	60.4774 (39)
Average = Sum(39)m / 12 =												59.8408

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8526	0.8494	0.8462	0.8311	0.8283	0.8152	0.8152	0.8128	0.8203	0.8283	0.8340	0.8400 (40)
HLP (average)												0.8311
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2937 (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												
72.2582	71.1851	69.6739	66.8875	64.8011	62.4876	61.2380	62.7386	64.3725	66.8480	69.6918	72.0139	(42b)
Hot water usage for other uses												
38.1196	36.7335	35.3473	33.9611	32.5749	31.1888	31.1888	32.5749	33.9611	35.3473	36.7335	38.1196	(42c)
Average daily hot water use (litres/day)												101.6490 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	110.3779	107.9185	105.0212	100.8486	97.3760	93.6764	92.4267	95.3135	98.3336	102.1953	106.4252	110.1336 (44)
Energy conte	174.8115	153.6746	161.4136	138.0567	131.0869	115.1860	111.7821	118.0181	121.2552	138.6781	151.6223	172.4426 (45)
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m												
26.2217	23.0512	24.2120	20.7085	19.6630	17.2779	16.7673	17.7027	18.1883	20.8017	22.7433	25.8664	(46)

Water storage loss (or HIU loss):

Store volume												15.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.4337 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.2342 (55)
Total storage loss												
7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595 (56)

If cylinder contains dedicated solar storage												
7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)

Total heat required for water heating calculated for each month

205.3335	181.2428	191.9356	167.5941	161.6088	144.7234	142.3041	148.5400	150.7925	169.2000	181.1596	202.9645	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
205.3335	181.2428	191.9356	167.5941	161.6088	144.7234	142.3041	148.5400	150.7925	169.2000	181.1596	202.9645	(64)

12Total per year (kWh/year) Total per year (kWh/year) = Sum(64)m = 2047.3988 (64)

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

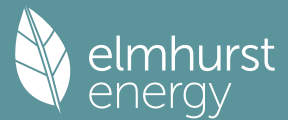
Heat gains from water heating, kWh/month												
82.5424	73.1513	78.0876	69.5337	68.0039	61.9292	61.5851	63.6586	63.9472	70.5280	74.0443	81.7547	(65)

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

Metabolic gains (Table 5), Watts												
(66)m	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
102.9807	114.0143	102.9807	106.4134	102.9807	106.4134	102.9807	102.9807	106.4134	102.9807	106.4134	102.9807	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
201.9192	204.0145	198.7344	187.4938	173.3045	159.9686	151.0594	148.9641	154.2442	165.4848	179.6741	193.0100	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	(71)
Water heating gains (Table 5)												
110.9441	108.8562	104.9564	96.5746	91.4031	86.0128	82.7757	85.5626	88.8156	94.7957	102.8393	109.8853	(72)
Total internal gains	476.2492	487.2902	467.0768	450.8871	428.0936	409.8001	394.2210	394.9126	406.8784	423.6664	449.3320	466.2813 (73)

6. Solar gains

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[Jan]	Area m2				Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
Southwest	5.9400				36.7938	0.6300		0.7000		0.7700	66.7934 (79)
Northwest	7.9600				11.2829	0.6300		0.7000		0.7700	27.4478 (81)
Solar gains	94.2411	169.6446	256.3316	358.1978	438.2606	451.3880	428.4043	366.1824	291.2154	194.0228	79.5764 (83)
Total gains	570.4903	656.9348	723.4084	809.0849	866.3542	861.1881	822.6253	761.0950	698.0938	617.6892	545.8577 (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
tau	72.3506	72.6288	72.9036	74.2226	74.4747	75.6712	75.6712	75.8970	75.2058	74.4747	73.9665
alpha	5.8234	5.8419	5.8602	5.9482	5.9650	6.0447	6.0447	6.0598	6.0137	5.9650	5.9311
util living area	0.9851	0.9666	0.9247	0.8046	0.6233	0.4346	0.3138	0.3533	0.5740	0.8582	0.9661
MIT	20.1958	20.3926	20.6272	20.8725	20.9745	20.9975	20.9997	20.9994	20.9881	20.8427	20.4946
Th 2	20.2079	20.2107	20.2135	20.2264	20.2289	20.2402	20.2402	20.2423	20.2358	20.2289	20.2240
util rest of house	0.9814	0.9587	0.9081	0.7707	0.5767	0.3837	0.2597	0.2953	0.5142	0.8234	0.9567
MIT 2	19.2795	19.5274	19.8152	20.1051	20.2087	20.2387	20.2401	20.2420	20.2281	20.0819	19.6678
Living area fraction	19.6104	19.8398	20.1084	20.3822	20.4853	20.5127	20.5144	20.5155	20.5026	20.3566	19.9664
MIT	19.6104	19.8398	20.1084	20.3822	20.4853	20.5127	20.5144	20.5155	20.5026	20.3566	19.9664
Temperature adjustment											
adjusted MIT	19.6104	19.8398	20.1084	20.3822	20.4853	20.5127	20.5144	20.5155	20.5026	20.3566	19.9664
8. Space heating requirement											
Utilisation	0.9778	0.9543	0.9056	0.7779	0.5925	0.4020	0.2792	0.3162	0.5354	0.8296	0.9530
Useful gains	557.8255	626.9208	655.1502	629.3714	513.3140	346.2023	229.6848	240.6936	373.7315	512.4558	537.3565
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000
Heat loss rate W	939.9073	913.6451	829.0843	687.1157	523.9459	347.0559	229.7591	240.8479	378.1318	581.8752	772.6143
Space heating kWh	284.2688	192.6787	129.4070	41.5759	7.9101	0.0000	0.0000	0.0000	0.0000	51.6480	169.3856
Space heating requirement - total per year (kWh/year)											
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Solar heating contribution - total per year (kWh/year)											
Space heating kWh	284.2688	192.6787	129.4070	41.5759	7.9101	0.0000	0.0000	0.0000	0.0000	51.6480	169.3856
Space heating requirement after solar contribution - total per year (kWh/year)											
Space heating per m2										(98c) / (4) =	16.2565 (99)
9a. Energy requirements - Individual heating systems, including micro-CHP											
Fraction of space heat from secondary/supplementary system (Table 11)											0.0000 (201)
Fraction of space heat from main system(s)											1.0000 (202)
Fraction of main heating from main system 2											0.0000 (203)
Fraction of total heating from main system 1											1.0000 (204)
Fraction of total heating from main system 2											0.0000 (205)
Efficiency of main space heating system 1 (in %)											92.3000 (206)
Efficiency of main space heating system 2 (in %)											88.8000 (207)
Efficiency of secondary/supplementary heating system, %											0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Space heating requirement	284.2688	192.6787	129.4070	41.5759	7.9101	0.0000	0.0000	0.0000	0.0000	51.6480	169.3856
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000
Space heating fuel (main heating system)	307.9836	208.7526	140.2026	45.0443	8.5700	0.0000	0.0000	0.0000	0.0000	55.9567	183.5163
Space heating efficiency (main heating system 2)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000
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
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
Space heating fuel used, main system 2											
Water heating											
Water heating requirement	205.3335	181.2428	191.9356	167.5941	161.6088	144.7234	142.3041	148.5400	150.7925	169.2000	181.1596
Efficiency of water heater	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000
Fuel for water heating, kWh/month	257.3101	227.1213	240.5208	210.0176	202.5173	181.3576	178.3259	186.1404	188.9631	212.0301	227.0171
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
Pumps and Fa	11.1260	10.0493	11.1260	10.7671	11.1260	10.7671	11.1260	11.1260	10.7671	11.1260	10.7671
Lighting	21.3974	17.1658	15.4559	11.3236	8.7467	7.1461	7.9790	10.3714	13.4715	17.6753	19.9642
Electricity generated by PVs (Appendix M) (negative quantity)	-8.6795	-13.4234	-21.1437	-26.1281	-30.3271	-29.1177	-28.7712	-26.0723	-21.7366	-16.3310	-9.9554
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity generated by PVs (Appendix M) (negative quantity)	-1.8627	-4.0801	-8.4223	-13.1265	-17.8362	-18.0951	-17.8768	-14.9085	-10.6388	-5.9795	-2.5319
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)											

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(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1268.1096	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2565.6626	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												131.0000	(231)
Electricity for lighting (calculated in Appendix L)												172.6889	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-355.8780	(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												3781.5831	(238)

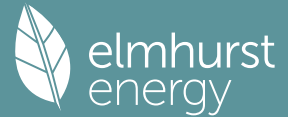
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1268.1096	0.2100	266.3030	(261)
Space heating - main system 2	0.0000	0.2100	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2565.6626	0.2100	538.7892	(264)
Space and water heating			805.0922	(265)
Pumps, fans and electric keep-hot	131.0000	0.1387	18.1713	(267)
Energy for lighting	172.6889	0.1443	24.9243	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-239.0588	0.1327	-31.7227	
PV Unit electricity exported	-116.8193	0.1248	-14.5838	
Total			-46.3065	(269)
Total CO2, kg/year			801.8813	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.1400	(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	1268.1096	1.1300	1432.9639	(275)
Space heating - main system 2	0.0000	1.1300	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2565.6626	1.1300	2899.1988	(278)
Space and water heating			4332.1626	(279)
Pumps, fans and electric keep-hot	131.0000	1.5128	198.1768	(281)
Energy for lighting	172.6889	1.5338	264.8760	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-239.0588	1.4903	-356.2745	
PV Unit electricity exported	-116.8193	0.4582	-53.5266	
Total			-409.8011	(283)
Total Primary energy kWh/year			4385.4144	(286)
Target Primary Energy Rate (TPER)			60.9100	(287)

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Plot Reference	05flr sample 5 Plot 16				Issued on Date	13/12/2025	
Assessment Reference	Block E 1B2P			Plot Type Ref	Block E 1B2P		
Plot Address					SAP Version	10.2	
SAP Rating	87 B	DER	1.12	TER	11.98		
Environmental	99 A	% DER < TER				90.65	
CO ₂ Emissions (t/year)	0.05	DFEE	15.81	TFEE	18.05		
Compliance Check	See BREL	% DFEE < TFEE				12.38	
% DPER < TPER	82.26	DPER	11.74	TPER	66.17		
Assessor Details	Mr. Andrew Jones				Assessor ID	N955-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	50.0000 (1b)	2.5000 (2b)	125.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	125.0000 (5)

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	3	(19)

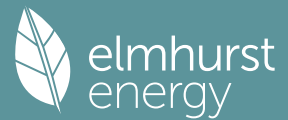
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												86.4000 (23c)
Effective ac	0.2162	0.2133	0.2104	0.1959	0.1930	0.1784	0.1784	0.1755	0.1842	0.1930	0.1988	0.2046 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows Open			7.9600	1.1450	9.1145		(27)
External Wall 1	17.5000	7.9600	9.5400	0.1500	1.4310	70.0000	667.8000 (29a)
Total net area of external elements Aum(A, m ²)			17.5000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	10.5455		(33)
Main dwelling							
Party Wall hall			55.0000	0.0000	0.0000	180.0000	9900.0000 (32)
Party Floor 1			50.0000			40.0000	2000.0000 (32a)
Party Ceiling 1			50.0000			30.0000	1500.0000 (32b)
Internal Wall 1			84.4500			9.0000	760.0500 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	14827.8500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							296.5570 (35)
Thermal bridges (User defined value 0.075 * total exposed area)							1.3125 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	11.8580 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	8.9190	8.7991	8.6793	8.0798	7.9600	7.3605	7.3605	7.2407	7.6003	7.9600	8.1997	8.4395	(38)
Heat transfer coeff	20.7770	20.6571	20.5373	19.9378	19.8180	19.2186	19.2186	19.0987	19.4583	19.8180	20.0577	20.2975	(39)
Average = Sum(39)m / 12 =												19.9079	
HLP	0.4155	0.4131	0.4107	0.3988	0.3964	0.3844	0.3844	0.3820	0.3892	0.3964	0.4012	0.4059	(40)
HLP (average)												0.3982	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6901 (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	60.5412	59.6421	58.3759	56.0413	54.2933	52.3549	51.3079	52.5652	53.9342	56.0083	58.3909	60.3365	(42b)
Hot water usage for other uses	31.9383	30.7769	29.6155	28.4541	27.2927	26.1314	26.1314	27.2927	28.4541	29.6155	30.7769	31.9383	(42c)
Average daily hot water use (litres/day)												85.1660	(43)
Daily hot water use	92.4795	90.4190	87.9914	84.4955	81.5860	78.4863	77.4393	79.8580	82.3883	85.6238	89.1678	92.2748	(44)
Energy conte	146.4649	128.7554	135.2396	115.6701	109.8304	96.5080	93.6561	98.8808	101.5930	116.1907	127.0359	144.4801	(45)
Energy content (annual)										Total = Sum(45)m =		1414.3051	
Distribution loss (46)m = 0.15 x (45)m	21.9697	19.3133	20.2859	17.3505	16.4746	14.4762	14.0484	14.8321	15.2390	17.4286	19.0554	21.6720	(46)
Water storage loss (or HIU loss):													
Store volume												15.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2500	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.1500	(55)
Total storage loss	4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500	(56)
If cylinder contains dedicated solar storage	4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	174.3773	153.9666	163.1520	142.6821	137.7428	123.5200	121.5685	126.7932	128.6050	144.1031	154.0479	172.3925	(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	174.3773	153.9666	163.1520	142.6821	137.7428	123.5200	121.5685	126.7932	128.6050	144.1031	154.0479	172.3925	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1742.9511	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000	(64a)
Heat gains from water heating, kWh/month	71.0295	62.9801	67.2971	60.0699	58.8485	53.6985	53.4706	55.2078	55.3893	60.9633	63.8490	70.3695	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.1176	88.7016	80.1176	82.7882	80.1176	82.7882	80.1176	80.1176	82.7882	80.1176	82.7882	80.1176	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.2339	148.7618	144.9117	136.7153	126.3689	116.6447	110.1484	108.6205	112.4706	120.6670	131.0134	140.7376	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	(71)
Water heating gains (Table 5)	95.4698	93.7204	90.4531	83.4304	79.0975	74.5813	71.8690	74.2040	76.9296	81.9400	88.6792	94.5827	(72)
Total internal gains	371.1728	379.5354	363.8339	351.2855	333.9355	322.3657	310.4865	311.2937	320.5399	331.0761	350.8323	363.7894	(73)

6. Solar gains

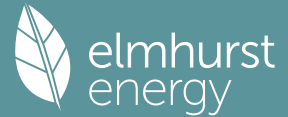
[Jan]					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
-----					Northwest	7.9600	11.2829	0.4000	0.6000	0.7700		14.9376 (81)	

Solar gains	14.9376	30.4059	54.7817	89.9672	120.9336	128.9280	120.6095	96.1513	66.7523	37.1584	18.7953	12.1988	(83)
Total gains	386.1104	409.9412	418.6155	441.2527	454.8692	451.2938	431.0961	407.4450	387.2922	368.2344	369.6277	375.9882	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	198.2404	199.3909	200.5548	206.5843	207.8340	214.3162	214.3162	215.6615	211.6754	207.8340	205.3496	202.9239	
alpha	14.2160	14.2927	14.3703	14.7723	14.8556	15.2877	15.2877	15.3774	15.1117	14.8556	14.6900	14.5283	
util living area	0.8738	0.8033	0.7098	0.5467	0.4052	0.2725	0.1962	0.2156	0.3467	0.5597	0.7513	0.8808	(86)

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MIT	20.9797	20.9930	20.9986	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	20.9977	20.9792 (87)
Th 2	20.5988	20.6011	20.6033	20.6145	20.6167	20.6279	20.6279	20.6302	20.6235	20.6167	20.6123	20.6078 (88)
util rest of house	0.8577	0.7852	0.6908	0.5293	0.3885	0.2567	0.1796	0.1983	0.3278	0.5391	0.7312	0.8653 (89)
MIT 2	20.5831	20.5959	20.6024	20.6145	20.6167	20.6279	20.6279	20.6302	20.6235	20.6167	20.6106	20.5915 (90)
Living area fraction									fLA = Living area / (4) =			0.5200 (91)
MIT	20.7893	20.8024	20.8084	20.8149	20.8160	20.8214	20.8214	20.8225	20.8193	20.8160	20.8119	20.7931 (92)
Temperature adjustment												0.0000
adjusted MIT	20.7893	20.8024	20.8084	20.8149	20.8160	20.8214	20.8214	20.8225	20.8193	20.8160	20.8119	20.7931 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8655	0.7944	0.7007	0.5383	0.3972	0.2649	0.1882	0.2073	0.3376	0.5498	0.7416	0.8727	(94)
Useful gains	334.1787	325.6485	293.3115	237.5464	180.6611	119.5665	81.1294	84.4636	130.7454	202.4478	274.1053	328.1367	(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	342.5992	328.4983	293.8558	237.5581	180.6612	119.5665	81.1294	84.4636	130.7455	202.4604	275.0294	336.7977	(97)
Space heating kWh	6.2649	1.9150	0.4050	0.0084	0.0001	0.0000	0.0000	0.0000	0.0000	0.0094	0.6654	6.4437	(98a)
Space heating requirement - total per year (kWh/year)												15.7118	
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	6.2649	1.9150	0.4050	0.0084	0.0001	0.0000	0.0000	0.0000	0.0000	0.0094	0.6654	6.4437	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												15.7118	
Space heating per m2										(98c) / (4) =		0.3142	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)
Fraction of space heat from community system												1.0000 (302)
Fraction of heat from community Heat pump-Space												1.0000 (303a)
Fraction of heat from community Heat pump-Water												1.0000 (303b)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500 (305)
Distribution loss factor (Table 12c) for community heating system												1.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	6.2649	1.9150	0.4050	0.0084	0.0001	0.0000	0.0000	0.0000	0.0000	0.0094	0.6654	6.4437 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00												
307a	6.5781	2.0108	0.4252	0.0088	0.0001	0.0000	0.0000	0.0000	0.0000	0.0098	0.6987	6.7659
Space heating requirement	6.5781	2.0108	0.4252	0.0088	0.0001	0.0000	0.0000	0.0000	0.0000	0.0098	0.6987	6.7659 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement	174.3773	153.9666	163.1520	142.6821	137.7428	123.5200	121.5685	126.7932	128.6050	144.1031	154.0479	172.3925 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00												
310b	174.3773	153.9666	163.1520	142.6821	137.7428	123.5200	121.5685	126.7932	128.6050	144.1031	154.0479	172.3925
Water heating fuel	174.3773	153.9666	163.1520	142.6821	137.7428	123.5200	121.5685	126.7932	128.6050	144.1031	154.0479	172.3925 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	9.7140	8.7740	9.7140	9.4007	9.7140	9.4007	9.7140	9.7140	9.4007	9.7140	9.4007	9.7140 (331)
Lighting	17.7795	14.2634	12.8426	9.4090	7.2678	5.9379	6.6299	8.6178	11.1937	14.6868	16.5887	18.2737 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-11.4813	-17.3463	-26.7544	-32.3531	-36.9056	-35.2244	-34.8011	-31.8324	-26.9518	-20.7977	-13.0289	-9.7944 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												16.4974 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												1742.9511 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution (space)												0.1650 (313)
Electricity used for heat distribution (water)												1.7239 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)												
mechanical ventilation fans (SFP = 0.7500)												114.3750 (330a)
Total electricity for the above, kWh/year												114.3750 (331)
Electricity for lighting (calculated in Appendix L)												143.4908 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-297.2713 (333)
Wind generation												0.0000 (334)
Hydro-electric generation (Appendix N)												0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (335)
Appendix Q - special features												
Energy saved or generated												-0.0000 (336)
Energy used												0.0000 (337)
Total delivered energy for all uses												1720.0431 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
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Efficiency of heat source Heat pump			330.0000 (367)
Space heating from Heat pump	4.9992	0.1618	0.8091 (367)
Efficiency of heat source Heat pump			440.0000 (367)
Water heating from Heat pump	396.1252	0.0000	0.0000 (368)
Electrical energy for heat distribution (space & water)	0.1650	0.0000	2.4844 (372)
Overall CO2 factor for heat network (space)			0.0507 (386)
Overall CO2 factor for heat network (water)			0.0335 (386)
Total CO2 associated with community systems			59.1509 (373)
Space and water heating			59.1509 (376)
Pumps, fans and electric keep-hot	114.3750	0.1387	15.8652 (378)
Energy for lighting	143.4908	0.1443	20.7102 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-297.2713	0.1331	-39.5738
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-39.5738 (380)
Total CO2, kg/year			56.1524 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.1200 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			330.0000 (467a)
Space heating from Heat pump	4.9992	1.5989	7.9932 (467)
Efficiency of heat source Heat pump			440.0000 (467b)
Water heating from Heat pump	396.1252	0.0000	0.0000 (468)
Electrical energy for heat distribution (space & water)	0.1650	0.0000	26.7811 (472)
Overall CO2 factor for heat network (space)			0.5005 (486)
Overall CO2 factor for heat network (water)			0.3610 (486)
Total CO2 associated with community systems			637.4419 (473)
Space and water heating			637.4419 (476)
Pumps, fans and electric keep-hot	114.3750	1.5128	173.0265 (478)
Energy for lighting	143.4908	1.5338	220.0910 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-297.2713	1.4919	-443.5045
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-443.5045 (480)
Total Primary energy kWh/year			587.0549 (483)
Dwelling Primary energy Rate (DPER)			11.7400 (484)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	50.0000	2.5000	125.0000
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000		
Dwelling volume			125.0000

2. Ventilation rate

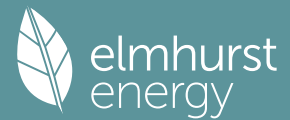
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1600 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4100 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (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	0.4051	0.3972	0.3892	0.3495	0.3416	0.3019	0.3019	0.2939	0.3178	0.3416	0.3575	0.3734 (22b)
Effective ac	0.5821	0.5789	0.5758	0.5611	0.5583	0.5456	0.5456	0.5432	0.5505	0.5583	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
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Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K						
TER Opening Type			7.9600	1.1450	9.1145			(27)					
External Wall 1	17.5000	7.9600	9.5400	0.1800	1.7172			(29a)					
Total net area of external elements Aum(A, m2)			17.5000					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		10.8317			(33)					
Main dwelling													
Party Wall hall			55.0000	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							296.5570	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				44.0000	0.0000	0.0000							
E7 Party floor between dwellings (in blocks of flats)				14.0000	0.0700	0.9800							
E1 Steel lintel with perforated steel base plate				3.8000	0.0500	0.1900							
E3 Sill				3.8000	0.0500	0.1900							
E4 Jamb				8.2000	0.0500	0.4100							
E18 Party wall between dwellings				10.0000	0.0600	0.6000							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							2.3700	(36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	13.2017	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	24.0102	23.8788	23.7499	23.1447	23.0315	22.5044	22.5044	22.4068	22.7074	23.0315	23.2605	23.5000	(38)
Average = Sum(39)m / 12 =	37.2119	37.0805	36.9516	36.3464	36.2332	35.7061	35.7061	35.6085	35.9091	36.2332	36.4622	36.7017	(39)
												36.3459	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.7442	0.7416	0.7390	0.7269	0.7247	0.7141	0.7141	0.7122	0.7182	0.7247	0.7292	0.7340	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6901	(42)
Hot water usage for mixer showers														
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths														
	60.5412	59.6421	58.3759	56.0413	54.2933	52.3549	51.3079	52.5652	53.9342	56.0083	58.3909	60.3365		(42b)
Hot water usage for other uses														
	31.9383	30.7769	29.6155	28.4541	27.2927	26.1314	26.1314	27.2927	28.4541	29.6155	30.7769	31.9383		(42c)
Average daily hot water use (litres/day)													85.1660	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use														
	92.4795	90.4190	87.9914	84.4955	81.5860	78.4863	77.4393	79.8580	82.3883	85.6238	89.1678	92.2748		(44)
Energy content (annual)	146.4649	128.7554	135.2396	115.6701	109.8304	96.5080	93.6561	98.8808	101.5930	116.1907	127.0359	144.4801		(45)
Distribution loss (46)m = 0.15 x (45)m										Total =	Sum(45)m =	1414.3051		
	21.9697	19.3133	20.2859	17.3505	16.4746	14.4762	14.0484	14.8321	15.2390	17.4286	19.0554	21.6720		(46)
Water storage loss (or HIU loss):														
Store volume													15.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):													0.4337	(48)
Temperature factor from Table 2b													0.5400	(49)
Enter (49) or (54) in (55)													0.2342	(55)
Total storage loss														
	7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595		(56)
If cylinder contains dedicated solar storage														
	7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595		(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624		(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(61)
Total heat required for water heating calculated for each month														
	176.9868	156.3236	165.7615	145.2074	140.3524	126.0454	124.1780	129.4027	131.1304	146.7126	156.5733	175.0020		(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														
	176.9868	156.3236	165.7615	145.2074	140.3524	126.0454	124.1780	129.4027	131.1304	146.7126	156.5733	175.0020		(64)
12Total per year (kWh/year)										Total per year (kWh/year) =	Sum(64)m =	1773.6762		(64)
Electric shower(s)												1774		(64)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000		(64a)
Heat gains from water heating, kWh/month														
	73.1171	64.8657	69.3847	62.0902	60.9362	55.7188	55.5582	57.2954	57.4096	63.0509	65.8693	72.4572		(65)

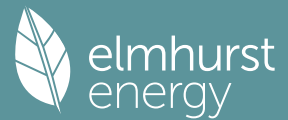
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	77.5536	85.8629	77.5536	80.1387	77.5536	80.1387	77.5536	77.5536	80.1387	77.5536	80.1387	77.5536	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	147.2339	148.7618	144.9117	136.7153	126.3689	116.6447	110.1484	108.6205	112.4706	120.6670	131.0134	140.7376	(68)
Pumps, fans	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	(69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Water heating gains (Table 5)	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	(71)
Total internal gains	98.2757	96.5264	93.2590	86.2364	81.9034	77.3872	74.6750	77.0100	79.7355	84.7459	91.4852	97.3887	(72)
	374.4147	382.5026	367.0758	354.4419	337.1774	322.5221	310.7284	311.5356	320.6963	334.3180	353.9888	367.0313	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W
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				W/m2		or Table 6b		or Table 6c		Table 6d			
Northwest		7.9600		11.2829		0.6300		0.7000		0.7700		27.4478 (81)	
Solar gains	27.4478	55.8707	100.6613	165.3148	222.2155	236.9053	221.6200	176.6781	122.6574	68.2785	34.5364	22.4152	(83)
Total gains	401.8625	438.3733	467.7371	519.7567	559.3930	559.4274	532.3485	488.2137	443.3537	402.5965	388.5252	389.4466	(84)
7. Mean internal temperature (heating season)													
Temperature during heating periods in the living area from Table 9, Th1 (C)													
Utilisation factor for gains for living area, nil,m (see Table 9a)												21.0000 (85)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	110.6863	111.0786	111.4660	113.3220	113.6761	115.3542	115.3542	115.6705	114.7020	113.6761	112.9620	112.2249	
alpha	8.3791	8.4052	8.4311	8.5548	8.5784	8.6903	8.6903	8.7114	8.6468	8.5784	8.5308	8.4817	
util living area	0.9907	0.9790	0.9441	0.8070	0.5993	0.4084	0.2951	0.3355	0.5572	0.8636	0.9737	0.9924	(86)
MIT	20.5539	20.6646	20.8116	20.9593	20.9965	20.9999	21.0000	21.0000	20.9986	20.9416	20.7427	20.5396	(87)
Th 2	20.3019	20.3042	20.3065	20.3171	20.3191	20.3284	20.3284	20.3301	20.3248	20.3191	20.3151	20.3109	(88)
util rest of house	0.9876	0.9726	0.9285	0.7719	0.5566	0.3656	0.2501	0.2866	0.5035	0.8266	0.9646	0.9899	(89)
MIT 2	19.7930	19.9328	20.1118	20.2816	20.3167	20.3283	20.3284	20.3301	20.3240	20.2693	20.0399	19.7825	(90)
Living area fraction	20.1887	20.3134	20.4757	20.6340	20.6702	20.6775	20.6776	20.6784	fLA = Living area / (4) =			0.5200	(91)
MIT	20.1887	20.3134	20.4757	20.6340	20.6702	20.6775	20.6776	20.6784	20.6748	20.6189	20.4053	20.1762	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1887	20.3134	20.4757	20.6340	20.6702	20.6775	20.6776	20.6784	20.6748	20.6189	20.4053	20.1762	(93)
8. Space heating requirement													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9871	0.9727	0.9326	0.7886	0.5787	0.3878	0.2735	0.3120	0.5314	0.8437	0.9659	0.9893	(94)
Useful gains	396.6587	426.3974	436.2117	409.8857	323.7196	216.9695	145.5943	152.3444	235.6189	339.6594	375.2958	385.2940	(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	591.2474	571.5346	516.4244	426.4894	325.0187	217.0049	145.5957	152.3485	236.0948	363.0164	485.1423	586.3540	(97)
Space heating kWh	144.7740	97.5322	59.6783	11.9546	0.9665	0.0000	0.0000	0.0000	0.0000	17.3776	79.0895	149.5886	(98a)
Space heating requirement - total per year (kWh/year)												560.9614	
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	144.7740	97.5322	59.6783	11.9546	0.9665	0.0000	0.0000	0.0000	0.0000	17.3776	79.0895	149.5886	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												560.9614	
Space heating per m2										(98c) / (4) =		11.2192	(99)
9a. Energy requirements - Individual heating systems, including micro-CHP													
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)	
Fraction of space heat from main system(s)												1.0000 (202)	
Fraction of main heating from main system 2												0.0000 (203)	
Fraction of total heating from main system 1												1.0000 (204)	
Fraction of total heating from main system 2												0.0000 (205)	
Efficiency of main space heating system 1 (in %)												92.3000 (206)	
Efficiency of main space heating system 2 (in %)												88.8000 (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	144.7740	97.5322	59.6783	11.9546	0.9665	0.0000	0.0000	0.0000	0.0000	17.3776	79.0895	149.5886	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	156.8516	105.6687	64.6569	12.9519	1.0472	0.0000	0.0000	0.0000	0.0000	18.8273	85.6874	162.0679	(211)
Space heating efficiency (main heating system 2)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement												175.0020 (64)	
Efficiency of water heater (217)m	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	(216)
Fuel for water heating, kWh/month	221.7880	195.8943	207.7212	181.9642	175.8802	157.9516	155.6115	162.1588	164.3238	183.8504	196.2071	219.3008	(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	11.1260	10.0493	11.1260	10.7671	11.1260	10.7671	11.1260	11.1260	10.7671	11.1260	10.7671	11.1260	(231)
Lighting	16.1141	12.9273	11.6396	8.5277	6.5870	5.3817	6.0089	7.8106	10.1452	13.3111	15.0348	16.5620	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-6.0757	-9.4236	-14.8876	-18.4580	-21.4862	-20.6606	-20.4238	-18.4833	-15.3679	-11.4971	-6.9806	-5.1585	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-1.2453	-2.7317	-5.6443	-8.8022	-11.9605	-12.1260	-11.9706	-9.9756	-7.1151	-3.9962	-1.6912	-0.9759	(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												607.7588 (211)	

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Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2222.6518	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	131.0000	(231)
Electricity for lighting (calculated in Appendix L)	130.0500	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-247.1375	(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	2844.3232	(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	607.7588	0.2100	127.6294 (261)
Space heating - main system 2	0.0000	0.2100	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2222.6518	0.2100	466.7569 (264)
Space and water heating			594.3862 (265)
Pumps, fans and electric keep-hot	131.0000	0.1387	18.1713 (267)
Energy for lighting	130.0500	0.1443	18.7702 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-168.9030	0.1326	-22.4014
PV Unit electricity exported	-78.2345	0.1248	-9.7671
Total			-32.1685 (269)
Total CO2, kg/year			599.1593 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.9800 (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	607.7588	1.1300	686.7675 (275)
Space heating - main system 2	0.0000	1.1300	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2222.6518	1.1300	2511.5966 (278)
Space and water heating			3198.3641 (279)
Pumps, fans and electric keep-hot	131.0000	1.5128	198.1768 (281)
Energy for lighting	130.0500	1.5338	199.4751 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-168.9030	1.4901	-251.6759
PV Unit electricity exported	-78.2345	0.4582	-35.8479
Total			-287.5238 (283)
Total Primary energy kWh/year			3308.4921 (286)
Target Primary Energy Rate (TPER)			66.1700 (287)

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Plot Reference	05flr sample 6 Plot 17			Issued on Date	13/12/2025
Assessment Reference	Block F 3B5P	Plot Type Ref	Block F 3B5P		
Plot Address				SAP Version	10.2
SAP Rating	91 B	DER	1.13	TER	9.55
Environmental	99 A	% DER < TER			88.17
CO ₂ Emissions (t/year)	0.09	DFEE	19.16	TFEE	19.17
Compliance Check	See BREL	% DFEE < TFEE			0.05
% DPER < TPER	77.38	DPER	11.78	TPER	52.08
Assessor Details	Mr. Andrew Jones			Assessor ID	N955-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	85.5000 (1b)	2.5000 (2b)	213.7500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	213.7500 (5)

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	2	(19)

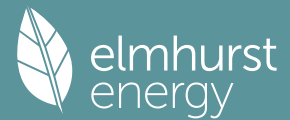
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												85.5000 (23c)
Effective ac	0.2351	0.2319	0.2287	0.2128	0.2096	0.1936	0.1936	0.1904	0.2000	0.2096	0.2159	0.2223 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows Open			17.9600	1.1450	20.5649		(27)
External Wall 1	43.7500	17.9600	25.7900	0.1500	3.8685	70.0000	1805.3000 (29a)
Total net area of external elements Aum(A, m ²)			43.7500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	24.4334		(33)
Main dwelling							
Party Wall hall			47.5000	0.0000	0.0000	180.0000	8550.0000 (32)
Party Floor 1			85.5000			40.0000	3420.0000 (32a)
Party Ceiling 1			85.5000			30.0000	2565.0000 (32b)
Internal Wall 1			187.3000			9.0000	1685.7000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	18026.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							210.8304 (35)
Thermal bridges (User defined value 0.075 * total exposed area)							3.2812 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	27.7146 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	16.5807	16.3559	16.1310	15.0069	14.7820	13.6578	13.6578	13.4330	14.1075	14.7820	15.2317	15.6814	(38)
Heat transfer coeff	44.2954	44.0705	43.8457	42.7215	42.4967	41.3725	41.3725	41.1476	41.8221	42.4967	42.9463	43.3960	(39)
Average = Sum(39)m / 12 =												42.6653	
HLP	0.5181	0.5154	0.5128	0.4997	0.4970	0.4839	0.4839	0.4813	0.4891	0.4970	0.5023	0.5076	(40)
HLP (average)												0.4990	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5590 (42)
Hot water usage for mixer showers													(42a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Hot water usage for baths													(42b)
77.4084	76.2588	74.6399	71.6549	69.4198	66.9414	65.6027	67.2103	68.9606	71.6126	74.6590	77.1467		
Hot water usage for other uses													(42c)
40.8366	39.3516	37.8666	36.3817	34.8967	33.4117	33.4117	34.8967	36.3817	37.8666	39.3516	40.8366		
Average daily hot water use (litres/day)												108.8939	(43)
Daily hot water use													
118.2450	115.6104	112.5065	108.0366	104.3165	100.3531	99.0144	102.1070	105.3423	109.4792	114.0106	117.9833	(44)	
Energy conte	187.2711	164.6276	172.9183	147.8966	140.4300	123.3959	119.7493	126.4297	129.8976	148.5623	162.4291	184.7333	(45)
Energy content (annual)												1808.3409	
Distribution loss (46)m = 0.15 x (45)m													
28.0907	24.6941	25.9377	22.1845	21.0645	18.5094	17.9624	18.9645	19.4846	22.2843	24.3644	27.7100	(46)	
Water storage loss (or HIU loss):													
Store volume												15.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2500	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.1500	(55)
Total storage loss													
4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500	(56)	
If cylinder contains dedicated solar storage													
4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500	(57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
215.1835	189.8388	200.8307	174.9086	168.3424	150.4079	147.6617	154.3421	156.9096	176.4747	189.4411	212.6457	(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	215.1835	189.8388	200.8307	174.9086	168.3424	150.4079	147.6617	154.3421	156.9096	176.4747	189.4411	212.6457	(64)
12Total per year (kWh/year)												2136.9869	(64)
Electric shower(s)												2137	(64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
84.5976	74.9076	79.8253	70.7852	69.0229	62.6387	62.1466	64.3678	64.8005	71.7269	75.6173	83.7537	(65)	

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

Metabolic gains (Table 5), Watts													
(66)m	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
118.7648	131.4896	118.7648	122.7236	118.7648	122.7236	118.7648	122.7236	118.7648	122.7236	118.7648	122.7236	118.7648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
230.5513	232.9437	226.9149	214.0803	197.8790	182.6521	172.4796	170.0872	176.1159	188.9505	205.1518	220.3787	(68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	(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)													
-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	(71)
Water heating gains (Table 5)													
113.7064	111.4697	107.2920	98.3128	92.7727	86.9982	83.5303	86.5159	90.0008	96.4071	105.0240	112.5722	(72)	
Total internal gains													
524.4072	537.2877	514.3565	496.5016	470.8013	453.7587	436.1595	436.7526	450.2251	465.5071	494.2841	513.1005	(73)	

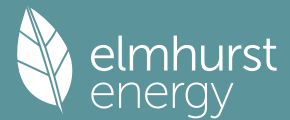
6. Solar gains

[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						7.4100	36.7938	0.4000	0.6000			0.7700			45.3459	(77)
Southwest						10.5500	36.7938	0.4000	0.6000			0.7700			64.5613	(79)
Solar gains	109.9071	187.2125	256.1523	317.3851	355.4978	352.9270	340.2593	311.8255	277.3588	206.9097	131.6434			94.0576	(83)	
Total gains	634.3144	724.5002	770.5087	813.8867	826.2991	806.6857	776.4188	748.5781	727.5838	672.4168	625.9275			607.1581	(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	113.0417	113.6184	114.2010	117.2062	117.8263	121.0279	121.0279	121.6892	119.7266	117.8263	116.5926	115.3844	
alpha	8.5361	8.5746	8.6134	8.8137	8.8551	9.0685	9.0685	9.1126	8.9818	8.8551	8.7728	8.6923	
util living area													

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	0.9501	0.8860	0.7924	0.6308	0.4779	0.3282	0.2345	0.2529	0.3966	0.6517	0.8751	0.9589 (86)
MIT	20.7742	20.8885	20.9584	20.9942	20.9995	21.0000	21.0000	21.0000	20.9999	20.9938	20.9187	20.7575 (87)
Th 2	20.5043	20.5067	20.5091	20.5211	20.5236	20.5356	20.5356	20.5380	20.5308	20.5236	20.5187	20.5139 (88)
util rest of house												
	0.9415	0.8708	0.7713	0.6069	0.4536	0.3044	0.2097	0.2275	0.3696	0.6234	0.8569	0.9516 (89)
MIT 2	20.3057	20.4129	20.4762	20.5170	20.5232	20.5356	20.5356	20.5380	20.5308	20.5193	20.4527	20.2989 (90)
Living area fraction												
MIT	20.4021	20.5108	20.5755	20.6152	20.6213	20.6312	20.6312	20.6331	20.6273	20.6170	20.5486	0.2058 (91)
Temperature adjustment												0.0000 (92)
adjusted MIT	20.4021	20.5108	20.5755	20.6152	20.6213	20.6312	20.6312	20.6331	20.6273	20.6170	20.5486	20.3933 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9396	0.8709	0.7742	0.6117	0.4586	0.3093	0.2148	0.2327	0.3752	0.6290	0.8580	0.9496	(94)
Useful gains	595.9990	630.9912	596.5505	497.8165	378.9173	249.5218	166.7811	174.1832	272.9614	422.9323	537.0723	576.5654	(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	713.2501	687.9758	617.1488	500.4922	379.1244	249.5259	166.7813	174.1834	272.9870	425.6887	577.5672	702.7251	(97)
Space heating kWh	87.2348	38.2937	15.3251	1.9266	0.1541	0.0000	0.0000	0.0000	0.0000	2.0508	29.1563	93.8628	(98a)
Space heating requirement - total per year (kWh/year)												268.0043	
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	87.2348	38.2937	15.3251	1.9266	0.1541	0.0000	0.0000	0.0000	0.0000	2.0508	29.1563	93.8628	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												268.0043	
Space heating per m2										(98c) / (4) =		3.1346	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (301)
Fraction of space heat from community system													1.0000 (302)
Fraction of heat from community Heat pump-Space													1.0000 (303a)
Fraction of heat from community Heat pump-Water													1.0000 (303b)
Factor for control and charging method (Table 4c(3)) for space heating													1.0500 (305)
Distribution loss factor (Table 12c) for community heating system													1.0000 (306)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating:													
Space heating requirement	87.2348	38.2937	15.3251	1.9266	0.1541	0.0000	0.0000	0.0000	0.0000	2.0508	29.1563	93.8628	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00													
307a	91.5966	40.2084	16.0914	2.0229	0.1618	0.0000	0.0000	0.0000	0.0000	2.1533	30.6142	98.5560	
Space heating requirement	91.5966	40.2084	16.0914	2.0229	0.1618	0.0000	0.0000	0.0000	0.0000	2.1533	30.6142	98.5560	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)													0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	215.1835	189.8388	200.8307	174.9086	168.3424	150.4079	147.6617	154.3421	156.9096	176.4747	189.4411	212.6457	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00													
310b	215.1835	189.8388	200.8307	174.9086	168.3424	150.4079	147.6617	154.3421	156.9096	176.4747	189.4411	212.6457	
Water heating fuel	215.1835	189.8388	200.8307	174.9086	168.3424	150.4079	147.6617	154.3421	156.9096	176.4747	189.4411	212.6457	(310)
Cooling System Energy Efficiency Ratio	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(311)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(312)
Pumps and Fa	14.6731	13.2531	14.6731	14.1997	14.6731	14.1997	14.6731	14.6731	14.1997	14.6731	14.1997	14.6731	(313)
Lighting	26.3560	21.1438	19.0376	13.9478	10.7737	8.8022	9.8281	12.7749	16.5934	21.7714	24.5907	27.0885	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-12.0947	-18.6291	-29.2888	-36.1220	-41.8273	-40.1294	-39.6203	-35.9182	-29.9659	-22.5954	-13.8383	-10.2782	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating													281.4045 (307)
Space heating fuel - secondary													0.0000 (309)
Water heating fuel - community heating													2136.9869 (310)
Efficiency of water heater													0.0000 (311)
Electricity used for heat distribution (space)													2.8140 (313)
Electricity used for heat distribution (water)													2.1265 (313)
Space cooling fuel													0.0000 (321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6625)													
mechanical ventilation fans (SFP = 0.6625)													172.7634 (330a)
Total electricity for the above, kWh/year													172.7634 (331)
Electricity for lighting (calculated in Appendix L)													212.7080 (332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-330.3077 (333)
Wind generation													0.0000 (334)
Hydro-electric generation (Appendix N)													0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)													0.0000 (335)
Appendix Q - special features													
Energy saved or generated													-0.0000 (336)
Energy used													0.0000 (337)
Total delivered energy for all uses													2473.5551 (338)

12b. Carbon dioxide emissions - Community heating scheme

Energy	Emission factor	Emissions
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	kWh/year	kg CO2/kWh	kg CO2/year
Efficiency of heat source Heat pump			330.0000 (367)
Space heating from Heat pump	85.2741	0.1603	13.6716 (367)
Efficiency of heat source Heat pump			440.0000 (367)
Water heating from Heat pump	485.6788	0.0000	0.0000 (368)
Electrical energy for heat distribution (space & water)	2.8140	0.0000	3.4666 (372)
Overall CO2 factor for heat network (space)			0.0502 (386)
Overall CO2 factor for heat network (water)			0.0335 (386)
Total CO2 associated with community systems			85.6713 (373)
Space and water heating			85.6713 (376)
Pumps, fans and electric keep-hot	172.7634	0.1387	23.9644 (378)
Energy for lighting	212.7080	0.1443	30.7003 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-330.3077	0.1328	-43.8499
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-43.8499 (380)
Total CO2, kg/year			96.4862 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.1300 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			330.0000 (467a)
Space heating from Heat pump	85.2741	1.5933	135.8714 (467)
Efficiency of heat source Heat pump			440.0000 (467b)
Water heating from Heat pump	485.6788	0.0000	0.0000 (468)
Electrical energy for heat distribution (space & water)	2.8140	0.0000	37.0039 (472)
Overall CO2 factor for heat network (space)			0.4988 (486)
Overall CO2 factor for heat network (water)			0.3611 (486)
Total CO2 associated with community systems			911.9695 (473)
Space and water heating			911.9695 (476)
Pumps, fans and electric keep-hot	172.7634	1.5128	261.3565 (478)
Energy for lighting	212.7080	1.5338	326.2586 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-330.3077	1.4905	-492.3346
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-492.3346 (480)
Total Primary energy kWh/year			1007.2501 (483)
Dwelling Primary energy Rate (DPER)			11.7800 (484)

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

1. Overall dwelling characteristics

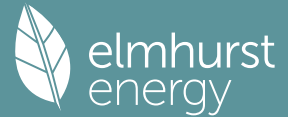
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	85.5000	2.5000	213.7500
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.5000		
Dwelling volume			

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	30.0000 / (5) = 0.1404 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3904 (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) = 0.3318 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000 (22)
Wind factor	1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 0.9500 0.9250 1.0000 1.0750 1.1250 1.1750 (22a)
Adj infilt rate	0.4230 0.4147 0.4065 0.3650 0.3567 0.3152 0.3152 0.3069 0.3318 0.3567 0.3733 0.3899 (22b)
Effective ac	0.5895 0.5860 0.5826 0.5666 0.5636 0.5497 0.5497 0.5471 0.5550 0.5636 0.5697 0.5760 (25)

3. Heat losses and heat loss parameter

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lement		Gross	Openings	NetArea	U-value	A x U	K-value	A x K					
Main dwelling		m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K					
TER Opening Type				17.9600	1.1450	20.5649		(27)					
External Wall 1	43.7500		17.9600	25.7900	0.1800	4.6422		(29a)					
Total net area of external elements Aum(A, m2)				43.7500				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)... (30) + (32) =		25.2071		(33)					
Main dwelling													
Party Wall hall				47.5000	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								210.8304 (35)					
List of Thermal Bridges													
K1 Element					Length	Psi-value	Total						
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)					38.0000	0.0000	0.0000						
E7 Party floor between dwellings (in blocks of flats)					35.0000	0.0700	2.4500						
E1 Steel lintel with perforated steel base plate					8.9400	0.0500	0.4470						
E3 Sill					8.9400	0.0500	0.4470						
E4 Jamb					23.8400	0.0500	1.1920						
E16 Corner (normal)					5.0000	0.0900	0.4500						
E18 Party wall between dwellings					5.0000	0.0600	0.3000						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								5.2860 (36)					
Point Thermal bridges							(36a) =	0.0000					
Total fabric heat loss							(33) + (36) + (36a) =	30.4931 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	41.5806	41.3355	41.0953	39.9669	39.7557	38.7729	38.7729	38.5909	39.1515	39.7557	40.1828	40.6294	(38)
Average = Sum(39)m / 12 =	72.0737	71.8286	71.5884	70.4600	70.2488	69.2660	69.2660	69.0840	69.6446	70.2488	70.6759	71.1224	(39)
												70.4589	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.8430	0.8401	0.8373	0.8241	0.8216	0.8101	0.8101	0.8080	0.8146	0.8216	0.8266	0.8318	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

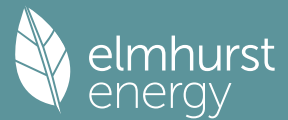
Assumed occupancy													2.5590 (42)
Hot water usage for mixer showers													
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for other uses	77.4084	76.2588	74.6399	71.6549	69.4198	66.9414	65.6027	67.2103	68.9606	71.6126	74.6590	77.1467	(42b)
Average daily hot water use (litres/day)	40.8366	39.3516	37.8666	36.3817	34.8967	33.4117	33.4117	34.8967	36.3817	37.8666	39.3516	40.8366	(42c)
												108.8939	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	118.2450	115.6104	112.5065	108.0366	104.3165	100.3531	99.0144	102.1070	105.3423	109.4792	114.0106	117.9833	(44)
Energy content (annual)	187.2711	164.6276	172.9183	147.8966	140.4300	123.3959	119.7493	126.4297	129.8976	148.5623	162.4291	184.7333	(45)
Distribution loss (46)m = 0.15 x (45)m	28.0907	24.6941	25.9377	22.1845	21.0645	18.5094	17.9624	18.9645	19.4846	22.2843	24.3644	27.7100	(46)
Water storage loss (or HIU loss):													
Store volume													15.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													0.4337 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.2342 (55)
Total storage loss	7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595	(56)
If cylinder contains dedicated solar storage	7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	217.7930	192.1958	203.4402	177.4340	170.9519	152.9332	150.2713	156.9517	159.4349	179.0842	191.9664	215.2552	(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	217.7930	192.1958	203.4402	177.4340	170.9519	152.9332	150.2713	156.9517	159.4349	179.0842	191.9664	215.2552	(64)
12Total per year (kWh/year)													2167.7120 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Heat gains from water heating, kWh/month	86.6852	76.7932	81.9129	72.8055	71.1105	64.6590	64.2342	66.4554	66.8208	73.8145	77.6375	85.8414	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	116.6033	129.0965	116.6033	120.4901	116.6033	120.4901	116.6033	116.6033	120.4901	116.6033	120.4901	116.6033	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	230.5513	232.9437	226.9149	214.0803	197.8790	182.6521	172.4796	170.0872	176.1159	188.9505	205.1518	220.3787	(68)
Pumps, fans	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	(69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Water heating gains (Table 5)	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	(71)
Total internal gains	116.5124	114.2757	110.0980	101.1188	95.5787	89.8042	86.3363	89.3218	92.8067	99.2130	107.8299	115.3782	(72)
	528.0517	540.7006	518.0009	500.0740	474.4458	454.3311	436.8040	437.3971	450.7975	469.1516	497.8566	516.7450	(73)

6. Solar gains

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[Jan]	Area m2				Solar flux Table 6a W/m2	Specific data or Table 6b		g	Specific data or Table 6c	FF	Access factor Table 6d		Gains W
Southeast	7.4100				36.7938	0.6300			0.7000		0.7700		83.3230 (77)
Southwest	10.5500				36.7938	0.6300			0.7000		0.7700		118.6313 (79)
Solar gains	201.9543	344.0030	470.6798	583.1951	653.2272	648.5034	625.2264	572.9794	509.6467	380.1965	241.8948	172.8308	(83)
Total gains	730.0060	884.7036	988.6808	1083.2691	1127.6730	1102.8345	1062.0304	1010.3765	960.4442	849.3482	739.7513	689.5758	(84)
7. Mean internal temperature (heating season)													
Temperature during heating periods in the living area from Table 9, Th1 (C)													
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4736	69.7107	69.9446	71.0648	71.2784	72.2897	72.2897	72.4802	71.8968	71.2784	70.8476	70.4028	
alpha	5.6316	5.6474	5.6630	5.7377	5.7519	5.8193	5.8193	5.8320	5.7931	5.7519	5.7232	5.6935	
util living area	0.9756	0.9377	0.8698	0.7341	0.5685	0.4008	0.2868	0.3143	0.4958	0.7809	0.9428	0.9810	(86)
MIT	20.2488	20.5001	20.7275	20.9119	20.9813	20.9980	20.9998	20.9996	20.9933	20.8966	20.5628	20.2057	(87)
Th 2	20.2162	20.2187	20.2211	20.2325	20.2346	20.2446	20.2446	20.2464	20.2407	20.2346	20.2303	20.2258	(88)
util rest of house	0.9700	0.9253	0.8471	0.6985	0.5250	0.3540	0.2377	0.2629	0.4430	0.7410	0.9291	0.9766	(89)
MIT 2	19.3551	19.6658	19.9369	20.1501	20.2198	20.2434	20.2445	20.2462	20.2364	20.1410	19.7566	19.3088	(90)
Living area fraction	fLA = Living area / (4) =												
MIT	19.5390	19.8375	20.0996	20.3069	20.3765	20.3987	20.3999	20.4013	20.3922	20.2966	19.9225	19.4934	(92)
Temperature adjustment	0.0000												
adjusted MIT	19.5390	19.8375	20.0996	20.3069	20.3765	20.3987	20.3999	20.4013	20.3922	20.2966	19.9225	19.4934	(93)
8. Space heating requirement													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9640	0.9183	0.8433	0.7021	0.5332	0.3636	0.2478	0.2735	0.4536	0.7444	0.9228	0.9713	(94)
Useful gains	703.7230	812.4438	833.7515	760.5319	601.2522	400.9369	263.1483	276.3227	435.6765	632.2323	682.6319	669.7953	(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	1098.3334	1072.9428	973.5762	803.7313	609.5173	401.6529	263.2074	276.4274	438.2175	681.1727	906.2443	1087.7063	(97)
Space heating kWh	293.5902	175.0553	104.0296	31.1035	6.1492	0.0000	0.0000	0.0000	0.0000	36.4117	161.0009	310.9257	(98a)
Space heating requirement - total per year (kWh/year)	1118.2662												
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	293.5902	175.0553	104.0296	31.1035	6.1492	0.0000	0.0000	0.0000	0.0000	36.4117	161.0009	310.9257	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1118.2662												
Space heating per m2	(98c) / (4) = 13.0791 (99)												
9a. Energy requirements - Individual heating systems, including micro-CHP													
Fraction of space heat from secondary/supplementary system (Table 11)													
0.0000 (201)													
Fraction of space heat from main system(s)													
1.0000 (202)													
Fraction of main heating from main system 2													
0.0000 (203)													
Fraction of total heating from main system 1													
1.0000 (204)													
Fraction of total heating from main system 2													
0.0000 (205)													
Efficiency of main space heating system 1 (in %)													
92.3000 (206)													
Efficiency of main space heating system 2 (in %)													
88.8000 (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	293.5902	175.0553	104.0296	31.1035	6.1492	0.0000	0.0000	0.0000	0.0000	36.4117	161.0009	310.9257	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	318.0825	189.6591	112.7081	33.6983	6.6622	0.0000	0.0000	0.0000	0.0000	39.4493	174.4322	336.8643	(211)
Space heating efficiency (main heating system 2)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating													
Water heating requirement	217.7930	192.1958	203.4402	177.4340	170.9519	152.9332	150.2713	156.9517	159.4349	179.0842	191.9664	215.2552	(64)
Efficiency of water heater	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	(216)
Fuel for water heating, kWh/month	272.9236	240.8469	254.9376	222.3484	214.2255	191.6456	188.3099	196.6813	199.7931	224.4163	240.5594	269.7434	(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	11.1260	10.0493	11.1260	10.7671	11.1260	10.7671	11.1260	11.1260	10.7671	11.1260	10.7671	11.1260	(231)
Lighting	24.2279	19.4365	17.5004	12.8215	9.9037	8.0914	9.0345	11.7434	15.2535	20.0134	22.6051	24.9012	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	(233a)m	-10.2544	-15.8297	-24.8868	-30.6912	-35.5629	-34.1170	-33.7053	-30.5695	-25.5273	-19.2280	-11.7503	-8.7131 (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	-2.2645	-4.9558	-10.2228	-15.9237	-21.6310	-21.9481	-21.6892	-18.0952	-12.9185	-7.2657	-3.0785	-1.7767 (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)													

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(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1211.5560	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2716.4310	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												131.0000	(231)
Electricity for lighting (calculated in Appendix L)												195.5327	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-422.6052	(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												3831.9146	(238)

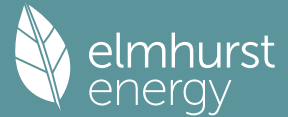
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1211.5560	0.2100	254.4268 (261)
Space heating - main system 2	0.0000	0.2100	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2716.4310	0.2100	570.4505 (264)
Space and water heating			824.8773 (265)
Pumps, fans and electric keep-hot	131.0000	0.1387	18.1713 (267)
Energy for lighting	195.5327	0.1443	28.2214 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-280.8355	0.1327	-37.2780
PV Unit electricity exported	-141.7697	0.1248	-17.6999
Total			-54.9779 (269)
Total CO2, kg/year			816.2921 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.5500 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1211.5560	1.1300	1369.0583 (275)
Space heating - main system 2	0.0000	1.1300	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2716.4310	1.1300	3069.5671 (278)
Space and water heating			4438.6253 (279)
Pumps, fans and electric keep-hot	131.0000	1.5128	198.1768 (281)
Energy for lighting	195.5327	1.5338	299.9146 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-280.8355	1.4905	-418.5788
PV Unit electricity exported	-141.7697	0.4582	-64.9635
Total			-483.5423 (283)
Total Primary energy kWh/year			4453.1745 (286)
Target Primary Energy Rate (TPER)			52.0800 (287)

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Plot Reference	06flr sample 1 Plot 18				Issued on Date	13/12/2025		
Assessment Reference	Block F 3B5P			Plot Type Ref	Block F 3B5P			
Plot Address					SAP Version	10.2		
SAP Rating	87 B		DER	1.54		TER	12.15	
Environmental	99 A		% DER < TER				87.33	
CO ₂ Emissions (t/year)	0.11		DFEE	29.04		TFEE	30.57	
Compliance Check	See BREL		% DFEE < TFEE				5.00	
% DPER < TPER	75.83		DPER	15.97		TPER	66.07	
Assessor Details	Mr. Andrew Jones				Assessor ID	N955-0001		
Client								

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	85.5000 (1b)	2.5000 (2b)	213.7500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	213.7500 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												85.5000 (23c)
Effective ac	0.2351	0.2319	0.2287	0.2128	0.2096	0.1936	0.1936	0.1904	0.2000	0.2096	0.2159	0.2223 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows Open			17.9600	1.1450	20.5649		(27)
External Wall 1	43.7500	17.9600	25.7900	0.1500	3.8685	70.0000	1805.3000 (29a)
External Roof 1	85.5000		85.5000	0.1100	9.4050	9.0000	769.5000 (30)
Total net area of external elements Aum(A, m ²)			129.2500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.8384		(33)
Main dwelling							
Party Wall hall			47.5000	0.0000	0.0000	180.0000	8550.0000 (32)
Party Floor 1			85.5000			40.0000	3420.0000 (32d)
Internal Wall 1			187.3000			9.0000	1685.7000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	16230.5000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							189.8304 (35)
Thermal bridges (User defined value 0.075 * total exposed area)							9.6937 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	43.5321 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	16.5807	16.3559	16.1310	15.0069	14.7820	13.6578	13.6578	13.4330	14.1075	14.7820	15.2317	15.6814	(38)
Heat transfer coeff	60.1129	59.8880	59.6632	58.5390	58.3142	57.1900	57.1900	56.9651	57.6396	58.3142	58.7638	59.2135	(39)
Average = Sum(39)m / 12 =												58.4828	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7031	0.7004	0.6978	0.6847	0.6820	0.6689	0.6689	0.6663	0.6741	0.6820	0.6873	0.6926	(40)
HLP (average)												0.6840	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5590 (42)
Hot water usage for mixer showers													(42a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for baths	77.4084	76.2588	74.6399	71.6549	69.4198	66.9414	65.6027	67.2103	68.9606	71.6126	74.6590	77.1467	(42c)
Hot water usage for other uses	40.8366	39.3516	37.8666	36.3817	34.8967	33.4117	33.4117	34.8967	36.3817	37.8666	39.3516	40.8366	(43)
Average daily hot water use (litres/day)												108.8939	(44)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	118.2450	115.6104	112.5065	108.0366	104.3165	100.3531	99.0144	102.1070	105.3423	109.4792	114.0106	117.9833	(45)
Energy conte	187.2711	164.6276	172.9183	147.8966	140.4300	123.3959	119.7493	126.4297	129.8976	148.5623	162.4291	184.7333	(46)
Energy content (annual)										Total = Sum(45)m =		1808.3409	(47)
Distribution loss (46)m = 0.15 x (45)m													
28.0907	24.6941	25.9377	22.1845	21.0645	18.5094	17.9624	18.9645	19.4846	22.2843	24.3644	27.7100	(48)	
Water storage loss (or HIU loss):													
Store volume												15.0000	(49)
a) If manufacturer declared loss factor is known (kWh/day):												0.2500	(50)
Temperature factor from Table 2b												0.6000	(51)
Enter (49) or (54) in (55)												0.1500	(52)
Total storage loss													
4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500	(53)
If cylinder contains dedicated solar storage													
4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500	(54)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(55)
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	(56)
Total heat required for water heating calculated for each month													
215.1835	189.8388	200.8307	174.9086	168.3424	150.4079	147.6617	154.3421	156.9096	176.4747	189.4411	212.6457	(57)	
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	(58)
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	(59)
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	(60)
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	(61)
Output from w/h	215.1835	189.8388	200.8307	174.9086	168.3424	150.4079	147.6617	154.3421	156.9096	176.4747	189.4411	212.6457	(62)
12Total per year (kWh/year)												2136.9869	(63)
Electric shower(s)												2137	(64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(66)
Heat gains from water heating, kWh/month													
84.5976	74.9076	79.8253	70.7852	69.0229	62.6387	62.1466	64.3678	64.8005	71.7269	75.6173	83.7537	(67)	

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	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	118.7648	131.4896	118.7648	122.7236	118.7648	122.7236	118.7648	118.7648	122.7236	118.7648	122.7236	118.7648 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	230.5513	232.9437	226.9149	214.0803	197.8790	182.6521	172.4796	170.0872	176.1159	188.9505	205.1518	220.3787 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949 (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)												
	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594 (71)
Water heating gains (Table 5)												
	113.7064	111.4697	107.2920	98.3128	92.7727	86.9982	83.5303	86.5159	90.0008	96.4071	105.0240	112.5722 (72)
Total internal gains												
	524.4072	537.2877	514.3565	496.5016	470.8013	453.7587	436.1595	436.7526	450.2251	465.5071	494.2841	513.1005 (73)

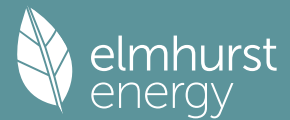
6. Solar gains

[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					7.4100	36.7938	0.4000	0.6000		0.7700		45.3459 (77)
Southwest					10.5500	36.7938	0.4000	0.6000		0.7700		64.5613 (79)
Solar gains	109.9071	187.2125	256.1523	317.3851	355.4978	352.9270	340.2593	311.8255	277.3588	206.9097	131.6434	94.0576 (83)
Total gains	634.3144	724.5002	770.5087	813.8867	826.2991	806.6857	776.4188	748.5781	727.5838	672.4168	625.9275	607.1581 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	75.0001	75.2817	75.5654	77.0166	77.3135	78.8333	78.8333	79.1444	78.2183	77.3135	76.7219	76.1393	
alpha	6.0000	6.0188	6.0377	6.1344	6.1542	6.2556	6.2556	6.2763	6.2146	6.1542	6.1148	6.0760	
util living area													

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	0.9756	0.9486	0.9025	0.7937	0.6386	0.4520	0.3239	0.3497	0.5407	0.8122	0.9460	0.9800 (86)
MIT	20.3372	20.5229	20.7074	20.8922	20.9746	20.9975	20.9997	20.9996	20.9926	20.8956	20.6117	20.3100 (87)
Th 2	20.3381	20.3404	20.3428	20.3544	20.3567	20.3684	20.3684	20.3707	20.3637	20.3567	20.3521	20.3474 (88)
util rest of house												
	0.9707	0.9392	0.8859	0.7648	0.5991	0.4080	0.2775	0.3020	0.4930	0.7794	0.9346	0.9759 (89)
MIT 2	19.7384	19.9197	20.0957	20.2713	20.3399	20.3671	20.3683	20.3706	20.3596	20.2790	20.0172	19.7198 (90)
Living area fraction												
MIT	19.8617	20.0439	20.2216	20.3991	20.4705	20.4969	20.4983	20.5001	20.4899	20.4059	20.1396	19.8413 (91)
Temperature adjustment												0.0000
adjusted MIT	19.8617	20.0439	20.2216	20.3991	20.4705	20.4969	20.4983	20.5001	20.4899	20.4059	20.1396	19.8413 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9665	0.9344	0.8826	0.7669	0.6062	0.4170	0.2871	0.3119	0.5026	0.7820	0.9303	0.9721	(94)
Useful gains	613.0648	676.9568	680.0144	624.1933	500.9283	336.4034	222.8781	233.4531	365.6495	525.8455	582.3102	590.2305	(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													
Space heating kWh	935.4563	906.9355	818.6771	673.1478	511.4450	337.2433	222.9429	233.5606	368.3135	571.8255	766.2542	926.1772	(97)
Space heating requirement - total per year (kWh/year)	239.8592	154.5457	103.1651	35.2472	7.8244	0.0000	0.0000	0.0000	0.0000	34.2092	132.4397	249.9443	(98a)
Solar heating kWh												957.2349	
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Space heating kWh	239.8592	154.5457	103.1651	35.2472	7.8244	0.0000	0.0000	0.0000	0.0000	34.2092	132.4397	249.9443	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												957.2349	
Space heating per m2										(98c) / (4) =		11.1957	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (301)
Fraction of space heat from community system													1.0000 (302)
Fraction of heat from community Heat pump-Space													1.0000 (303a)
Fraction of heat from community Heat pump-Water													1.0000 (303b)
Factor for control and charging method (Table 4c(3)) for space heating													1.0500 (305)
Distribution loss factor (Table 12c) for community heating system													1.0000 (306)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating:													
Space heating requirement	239.8592	154.5457	103.1651	35.2472	7.8244	0.0000	0.0000	0.0000	0.0000	34.2092	132.4397	249.9443	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00													
307a	251.8522	162.2730	108.3233	37.0096	8.2156	0.0000	0.0000	0.0000	0.0000	35.9196	139.0617	262.4415	
Space heating requirement	251.8522	162.2730	108.3233	37.0096	8.2156	0.0000	0.0000	0.0000	0.0000	35.9196	139.0617	262.4415	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)													0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	215.1835	189.8388	200.8307	174.9086	168.3424	150.4079	147.6617	154.3421	156.9096	176.4747	189.4411	212.6457	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00													
310b	215.1835	189.8388	200.8307	174.9086	168.3424	150.4079	147.6617	154.3421	156.9096	176.4747	189.4411	212.6457	
Water heating fuel	215.1835	189.8388	200.8307	174.9086	168.3424	150.4079	147.6617	154.3421	156.9096	176.4747	189.4411	212.6457	(310)
Cooling System Energy Efficiency Ratio	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(311)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(312)
Pumps and Fa	14.6731	13.2531	14.6731	14.1997	14.6731	14.1997	14.6731	14.6731	14.1997	14.6731	14.1997	14.6731	(313)
Lighting	26.3560	21.1438	19.0376	13.9478	10.7737	8.8022	9.8281	12.7749	16.5934	21.7714	24.5907	27.0885	(314)
Electricity generated by PVs (Appendix M) (negative quantity)	-12.0947	-18.6291	-29.2888	-36.1220	-41.8273	-40.1294	-39.6203	-35.9182	-29.9659	-22.5954	-13.8383	-10.2782	(315a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315d)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315e)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315f)
Annual totals kWh/year													
Space heating fuel - community heating													1005.0966 (307)
Space heating fuel - secondary													0.0000 (309)
Water heating fuel - community heating													2136.9869 (310)
Efficiency of water heater													0.0000 (311)
Electricity used for heat distribution (space)													10.0510 (313)
Electricity used for heat distribution (water)													2.1265 (313)
Space cooling fuel													0.0000 (321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6625)													
mechanical ventilation fans (SFP = 0.6625)													172.7634 (330a)
Total electricity for the above, kWh/year													172.7634 (331)
Electricity for lighting (calculated in Appendix L)													212.7080 (332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-330.3077 (333)
Wind generation													0.0000 (334)
Hydro-electric generation (Appendix N)													0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)													0.0000 (335b)
Appendix Q - special features													
Energy saved or generated													-0.0000 (336)
Energy used													0.0000 (337)
Total delivered energy for all uses													3197.2472 (338)

12b. Carbon dioxide emissions - Community heating scheme

Energy	Emission factor	Emissions
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	kWh/year	kg CO2/kWh	kg CO2/year
Efficiency of heat source Heat pump			330.0000 (367)
Space heating from Heat pump	304.5747	0.1578	48.0689 (367)
Efficiency of heat source Heat pump			440.0000 (367)
Water heating from Heat pump	485.6788	0.0000	0.0000 (368)
Electrical energy for heat distribution (space & water)	10.0510	0.0000	4.6017 (372)
Overall CO2 factor for heat network (space)			0.0494 (386)
Overall CO2 factor for heat network (water)			0.0335 (386)
Total CO2 associated with community systems			121.2036 (373)
Space and water heating			121.2036 (376)
Pumps, fans and electric keep-hot	172.7634	0.1387	23.9644 (378)
Energy for lighting	212.7080	0.1443	30.7003 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-330.3077	0.1328	-43.8499
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-43.8499 (380)
Total CO2, kg/year			132.0185 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.5400 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			330.0000 (467a)
Space heating from Heat pump	304.5747	1.5842	482.5145 (467)
Efficiency of heat source Heat pump			440.0000 (467b)
Water heating from Heat pump	485.6788	0.0000	0.0000 (468)
Electrical energy for heat distribution (space & water)	10.0510	0.0000	48.4431 (472)
Overall CO2 factor for heat network (space)			0.4959 (486)
Overall CO2 factor for heat network (water)			0.3611 (486)
Total CO2 associated with community systems			1270.0518 (473)
Space and water heating			1270.0518 (476)
Pumps, fans and electric keep-hot	172.7634	1.5128	261.3565 (478)
Energy for lighting	212.7080	1.5338	326.2586 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-330.3077	1.4905	-492.3346
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-492.3346 (480)
Total Primary energy kWh/year			1365.3323 (483)
Dwelling Primary energy Rate (DPER)			15.9700 (484)

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

1. Overall dwelling characteristics

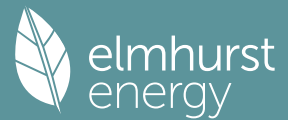
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	85.5000	2.5000	213.7500
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.5000		
Dwelling volume			

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1404 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3904 (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) = 0.3318 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000 (22)
Wind factor	1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 0.9500 0.9250 1.0000 1.0750 1.1250 1.1750 (22a)
Adj infilt rate	0.4230 0.4147 0.4065 0.3650 0.3567 0.3152 0.3152 0.3069 0.3318 0.3567 0.3733 0.3899 (22b)
Effective ac	0.5895 0.5860 0.5826 0.5666 0.5636 0.5497 0.5497 0.5471 0.5550 0.5636 0.5697 0.5760 (25)

3. Heat losses and heat loss parameter

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Element				Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K		
Main dwelling												
TER Opening Type						17.9600	1.1450	20.5649			(27)	
External Wall 1				43.7500	17.9600	25.7900	0.1800	4.6422			(29a)	
External Roof 1				85.5000		85.5000	0.1100	9.4050			(30)	
Total net area of external elements Aum(A, m2)						129.2500					(31)	
Fabric heat loss, W/K = Sum (A x U)						(26)...(30) + (32) =		34.6121			(33)	
Main dwelling												
Party Wall hall						47.5000	0.0000	0.0000			(32)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K											189.8304 (35)	
List of Thermal Bridges												
K1 Element							Length	Psi-value		Total		
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)							19.0000	0.0000		0.0000		
E7 Party floor between dwellings (in blocks of flats)							17.5000	0.0700		1.2250		
E15 Flat roof with parapet							17.5000	0.5600		9.8000		
P4 Party wall - Roof (insulation at ceiling level)							19.0000	0.1200		2.2800		
E1 Steel lintel with perforated steel base plate							8.9400	0.0500		0.4470		
E3 Sill							8.9400	0.0500		0.4470		
E4 Jamb							23.8400	0.0500		1.1920		
E16 Corner (normal)							5.0000	0.0900		0.4500		
E18 Party wall between dwellings							5.0000	0.0600		0.3000		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)									(36a) =	16.1410	(36)	
Point Thermal bridges										0.0000		
Total fabric heat loss								(33) + (36) + (36a) =		50.7531	(37)	
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	41.5806	41.3355	41.0953	39.9669	39.7557	38.7729	38.7729	38.5909	39.1515	39.7557	40.1828	40.6294 (38)
Average = Sum(39)m / 12 =	92.3337	92.0886	91.8484	90.7200	90.5088	89.5260	89.5260	89.3440	89.9046	90.5088	90.9359	91.3824 (39)
												90.7189
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0799	1.0771	1.0742	1.0611	1.0586	1.0471	1.0471	1.0450	1.0515	1.0586	1.0636	1.0688 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

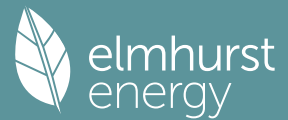
4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.5590 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths	77.4084	76.2588	74.6399	71.6549	69.4198	66.9414	65.6027	67.2103	68.9606	71.6126	74.6590	77.1467 (42b)
Hot water usage for other uses	40.8366	39.3516	37.8666	36.3817	34.8967	33.4117	33.4117	34.8967	36.3817	37.8666	39.3516	40.8366 (42c)
Average daily hot water use (litres/day)												108.8939 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	118.2450	115.6104	112.5065	108.0366	104.3165	100.3531	99.0144	102.1070	105.3423	109.4792	114.0106	117.9833 (44)
Energy content (annual)	187.2711	164.6276	172.9183	147.8966	140.4300	123.3959	119.7493	126.4297	129.8976	148.5623	162.4291	184.7333 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1808.3409
Water storage loss (or HIU loss):	28.0907	24.6941	25.9377	22.1845	21.0645	18.5094	17.9624	18.9645	19.4846	22.2843	24.3644	27.7100 (46)
Store volume												15.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.4337 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.2342 (55)
Total storage loss	7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595 (56)
If cylinder contains dedicated solar storage	7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	217.7930	192.1958	203.4402	177.4340	170.9519	152.9332	150.2713	156.9517	159.4349	179.0842	191.9664	215.2552 (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	217.7930	192.1958	203.4402	177.4340	170.9519	152.9332	150.2713	156.9517	159.4349	179.0842	191.9664	215.2552 (64)
12Total per year (kWh/year)												2167.7120 (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	86.6852	76.7932	81.9129	72.8055	71.1105	64.6590	64.2342	66.4554	66.8208	73.8145	77.6375	85.8414 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	116.6033	129.0965	116.6033	120.4901	116.6033	120.4901	116.6033	116.6033	120.4901	116.6033	120.4901	116.6033 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	230.5513	232.9437	226.9149	214.0803	197.8790	182.6521	172.4796	170.0872	176.1159	188.9505	205.1518	220.3787 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594 (71)
Water heating gains (Table 5)	116.5124	114.2757	110.0980	101.1188	95.5787	89.8042	86.3363	89.3218	92.8067	99.2130	107.8299	115.3782 (72)
Total internal gains	528.0517	540.7006	518.0009	500.0740	474.4458	454.3311	436.8040	437.3971	450.7975	469.1516	497.8566	516.7450 (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				7.4100	36.7938	0.6300	0.7000	0.7700	83.3230 (77)			
Southwest				10.5500	36.7938	0.6300	0.7000	0.7700	118.6313 (79)			
Solar gains	201.9543	344.0030	470.6798	583.1951	653.2272	648.5034	625.2264	572.9794	509.6467	380.1965	241.8948	172.8308 (83)
Total gains	730.0060	884.7036	988.6808	1083.2691	1127.6730	1102.8345	1062.0304	1010.3765	960.4442	849.3482	739.7513	689.5758 (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	48.8280	48.9580	49.0860	49.6966	49.8125	50.3594	50.3594	50.4619	50.1473	49.8125	49.5786	49.3363
alpha	4.2552	4.2639	4.2724	4.3131	4.3208	4.3573	4.3573	4.3641	4.3432	4.3208	4.3052	4.2891
util living area	0.9777	0.9522	0.9089	0.8171	0.6786	0.5047	0.3678	0.4020	0.6080	0.8513	0.9561	0.9819 (86)
MIT	19.6970	19.9922	20.3177	20.6642	20.8791	20.9741	20.9948	20.9923	20.9423	20.6550	20.1209	19.6466 (87)
Th 2	20.0173	20.0196	20.0219	20.0328	20.0348	20.0443	20.0443	20.0460	20.0406	20.0348	20.0307	20.0264 (88)
util rest of house	0.9726	0.9419	0.8900	0.7823	0.6248	0.4348	0.2894	0.3208	0.5359	0.8142	0.9448	0.9777 (89)
MIT 2	18.5209	18.8904	19.2901	19.7033	19.9337	20.0283	20.0422	20.0428	20.0012	19.7054	19.0644	18.4639 (90)
Living area fraction												0.2058 (91)
MIT	18.7630	19.1172	19.5016	19.9011	20.1283	20.2230	20.2383	20.2383	20.1950	19.9009	19.2818	18.7074 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7630	19.1172	19.5016	19.9011	20.1283	20.2230	20.2383	20.2383	20.1950	19.9009	19.2818	18.7074 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9638	0.9302	0.8782	0.7771	0.6303	0.4482	0.3055	0.3374	0.5480	0.8084	0.9338	0.9700 (94)
Useful gains	703.5687	822.9163	868.2591	841.8047	710.7365	494.2917	324.4117	340.8916	526.3189	686.6332	690.8005	668.8720 (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	1335.4234	1309.2443	1194.1770	998.0163	762.8387	503.4041	325.7239	342.9261	547.9654	841.8134	1107.7674	1325.7211 (97)
Space heating kWh	470.0999	326.8124	242.4829	112.4724	38.7640	0.0000	0.0000	0.0000	0.0000	115.4540	300.2162	488.6958 (98a)
Space heating requirement - total per year (kWh/year)												2094.9976
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	470.0999	326.8124	242.4829	112.4724	38.7640	0.0000	0.0000	0.0000	0.0000	115.4540	300.2162	488.6958 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2094.9976
Space heating per m2										(98c) / (4) =		24.5029 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Fraction of main heating from main system 2												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												88.8000 (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	470.0999	326.8124	242.4829	112.4724	38.7640	0.0000	0.0000	0.0000	0.0000	115.4540	300.2162	488.6958 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	509.3173	354.0763	262.7117	121.8552	41.9978	0.0000	0.0000	0.0000	0.0000	125.0856	325.2613	529.4645 (211)
Space heating efficiency (main heating system 2)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Space heating fuel used, main system 2												0.0000 (213)
Water heating												
Water heating requirement	217.7930	192.1958	203.4402	177.4340	170.9519	152.9332	150.2713	156.9517	159.4349	179.0842	191.9664	215.2552 (64)
Efficiency of water heater	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000 (216)
Fuel for water heating, kWh/month	272.9236	240.8469	254.9376	222.3484	214.2255	191.6456	188.3099	196.6813	199.7931	224.4163	240.5594	269.7434 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	11.1260	10.0493	11.1260	10.7671	11.1260	10.7671	11.1260	11.1260	10.7671	11.1260	10.7671	11.1260 (231)
Lighting	24.2279	19.4365	17.5004	12.8215	9.9037	8.0914	9.0345	11.7434	15.2535	20.0134	22.6051	24.9012 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-10.2544	-15.8297	-24.8868	-30.6912	-35.5629	-34.1170	-33.7053	-30.5695	-25.5273	-19.2280	-11.7503	-8.7131 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-2.2645	-4.9558	-10.2228	-15.9237	-21.6310	-21.9481	-21.6892	-18.0952	-12.9185	-7.2657	-3.0785	-1.7767 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

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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											2269.7699	(211)
Space heating fuel - main system 2											0.0000	(213)
Space heating fuel - secondary											0.0000	(215)
Efficiency of water heater											79.8000	
Water heating fuel used											2716.4310	(219)
Space cooling fuel											0.0000	(221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year											131.0000	(231)
Electricity for lighting (calculated in Appendix L)											195.5327	(232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation											-422.6052	(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											4890.1285	(238)

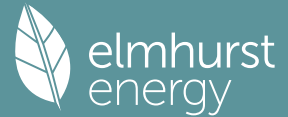
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2269.7699	0.2100	476.6517 (261)
Space heating - main system 2	0.0000	0.2100	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2716.4310	0.2100	570.4505 (264)
Space and water heating			1047.1022 (265)
Pumps, fans and electric keep-hot	131.0000	0.1387	18.1713 (267)
Energy for lighting	195.5327	0.1443	28.2214 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-280.8355	0.1327	-37.2780
PV Unit electricity exported	-141.7697	0.1248	-17.6999
Total			-54.9779 (269)
Total CO2, kg/year			1038.5170 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.1500 (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	2269.7699	1.1300	2564.8399 (275)
Space heating - main system 2	0.0000	1.1300	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2716.4310	1.1300	3069.5671 (278)
Space and water heating			5634.4070 (279)
Pumps, fans and electric keep-hot	131.0000	1.5128	198.1768 (281)
Energy for lighting	195.5327	1.5338	299.9146 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-280.8355	1.4905	-418.5788
PV Unit electricity exported	-141.7697	0.4582	-64.9635
Total			-483.5423 (283)
Total Primary energy kWh/year			5648.9562 (286)
Target Primary Energy Rate (TPER)			66.0700 (287)

Full SAP Calculation Printout



Plot Reference	07flr sample 1 Plot 19				Issued on Date	13/12/2025		
Assessment Reference	Block E 2B4P			Plot Type Ref	Block E 2B4P			
Plot Address					SAP Version	10.2		
SAP Rating	88 B		DER	1.19		TER	10.76	
Environmental	99 A		% DER < TER				88.94	
CO ₂ Emissions (t/year)	0.08		DFEE	19.79		TFEE	20.56	
Compliance Check	See BREL		% DFEE < TFEE				3.74	
% DPER < TPER	78.95		DPER	12.40		TPER	58.92	
Assessor Details	Mr. Andrew Jones				Assessor ID	N955-0001		
Client								

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.0000		180.0000 (1b) - (3b)
Dwelling volume			180.0000 (4)

2. Ventilation rate

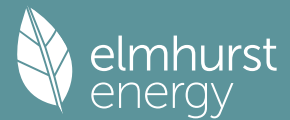
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												86.4000 (23c)
Effective ac	0.2306	0.2274	0.2242	0.2082	0.2051	0.1891	0.1891	0.1859	0.1955	0.2051	0.2114	0.2178 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows Open			12.9800	1.1450	14.7481		(27)
External Wall 1	42.5000	12.8800	29.6200	0.1500	4.4430	70.0000	2073.4000 (29a)
Total net area of external elements Aum(A, m ²)			42.5000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 19.1911		(33)
Main dwelling							
Party Wall hall			42.5000	0.0000	0.0000	180.0000	7650.0000 (32)
Party Floor 1			72.0000			40.0000	2880.0000 (32a)
Party Ceiling 1			72.0000			30.0000	2160.0000 (32b)
Internal Wall 1			144.2000			9.0000	1297.8000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	16061.2000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							223.0722 (35)
Thermal bridges (User defined value 0.075 * total exposed area)							3.1875 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	22.3786 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	13.6954	13.5061	13.3167	12.3700	12.1807	11.2340	11.2340	11.0447	11.6127	12.1807	12.5594	12.9381	(38)
Heat transfer coeff	36.0740	35.8847	35.6953	34.7486	34.5593	33.6126	33.6126	33.4233	33.9913	34.5593	34.9380	35.3167	(39)
Average = Sum(39)m / 12 =												34.7013	
HLP	0.5010	0.4984	0.4958	0.4826	0.4800	0.4668	0.4668	0.4642	0.4721	0.4800	0.4852	0.4905	(40)
HLP (average)												0.4820	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2937 (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	72.2582	71.1851	69.6739	66.8875	64.8011	62.4876	61.2380	62.7386	64.3725	66.8480	69.6918	72.0139	(42b)
Hot water usage for other uses	38.1196	36.7335	35.3473	33.9611	32.5749	31.1888	31.1888	32.5749	33.9611	35.3473	36.7335	38.1196	(42c)
Average daily hot water use (litres/day)												101.6490	(43)
Daily hot water use	110.3779	107.9185	105.0212	100.8486	97.3760	93.6764	92.4267	95.3135	98.3336	102.1953	106.4252	110.1336	(44)
Energy conte	174.8115	153.6746	161.4136	138.0567	131.0869	115.1860	111.7821	118.0181	121.2552	138.6781	151.6223	172.4426	(45)
Energy content (annual)										Total = Sum(45)m =		1688.0277	
Distribution loss (46)m = 0.15 x (45)m	26.2217	23.0512	24.2120	20.7085	19.6630	17.2779	16.7673	17.7027	18.1883	20.8017	22.7433	25.8664	(46)
Water storage loss (or HIU loss):													
Store volume												15.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2500	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.1500	(55)
Total storage loss	4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500	(56)
If cylinder contains dedicated solar storage	4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	202.7239	178.8858	189.3260	165.0687	158.9993	142.1980	139.6945	145.9305	148.2672	166.5905	178.6343	200.3550	(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	202.7239	178.8858	189.3260	165.0687	158.9993	142.1980	139.6945	145.9305	148.2672	166.5905	178.6343	200.3550	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2016.6737	(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	80.4548	71.2658	76.0000	67.5135	65.9163	59.9090	59.4975	61.5709	61.9270	68.4404	72.0240	79.6671	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.1694	118.6519	107.1694	110.7418	107.1694	110.7418	107.1694	107.1694	110.7418	107.1694	110.7418	107.1694	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.9192	204.0145	198.7344	187.4938	173.3045	159.9686	151.0594	148.9641	154.2442	165.4848	179.6741	193.0100	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	(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)	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	(71)
Water heating gains (Table 5)	108.1381	106.0502	102.1505	93.7687	88.5972	83.2069	79.9697	82.7566	86.0097	91.9898	100.0333	107.0794	(72)
Total internal gains	474.6320	486.1218	465.4596	449.4095	426.4764	411.3225	395.6038	396.2954	408.4008	422.0492	447.8544	464.6641	(73)

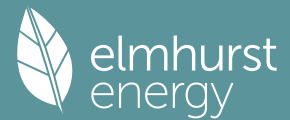
6. Solar gains

[Jan]													
					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
Southwest					8.5900	36.7938		0.4000	0.6000	0.7700		52.5669 (79)	
Northwest					4.2900	11.2829		0.4000	0.6000	0.7700		8.0505 (81)	
Solar gains	60.6175	105.9280	152.0381	200.2879	235.2058	238.2848	227.7428	200.9618	168.6324	118.9881	73.0927	51.5608 (83)	
Total gains	535.2495	592.0499	617.4977	649.6974	661.6822	649.6073	623.3466	597.2572	577.0332	541.0374	520.9471	516.2249 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	123.6748	124.3273	124.9868	128.3919	129.0953	132.7312	132.7312	133.4831	131.2526	129.0953	127.6961	126.3269	
alpha	9.2450	9.2885	9.3325	9.5595	9.6064	9.8487	9.8487	9.8989	9.7502	9.6064	9.5131	9.4218	
util living area													

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	0.9468	0.8914	0.8070	0.6436	0.4855	0.3312	0.2373	0.2574	0.4064	0.6599	0.8701	0.9543 (86)
MIT	20.8212	20.9065	20.9640	20.9956	20.9997	21.0000	21.0000	21.0000	21.0000	20.9955	20.9393	20.8113 (87)
Th 2	20.5199	20.5223	20.5247	20.5368	20.5392	20.5513	20.5513	20.5537	20.5465	20.5392	20.5344	20.5295 (88)
util rest of house												
	0.9375	0.8764	0.7863	0.6198	0.4615	0.3079	0.2131	0.2324	0.3797	0.6319	0.8513	0.9461 (89)
MIT 2	20.3642	20.4442	20.4965	20.5337	20.5390	20.5513	20.5513	20.5537	20.5465	20.5362	20.4858	20.3641 (90)
Living area fraction										FLA = Living area / (4) =		0.3611 (91)
MIT	20.5292	20.6112	20.6653	20.7005	20.7054	20.7133	20.7133	20.7149	20.7102	20.7020	20.6496	20.5256 (92)
Temperature adjustment												0.0000
adjusted MIT	20.5292	20.6112	20.6653	20.7005	20.7054	20.7133	20.7133	20.7149	20.7102	20.7020	20.6496	20.5256 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9377	0.8793	0.7925	0.6283	0.4702	0.3163	0.2218	0.2415	0.3894	0.6418	0.8561	0.9460 (94)	
Useful gains	501.9029	520.5797	489.3893	408.1787	311.1021	205.4837	138.2602	144.2178	224.6759	347.2601	445.9945	488.3515 (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	585.4527	563.7902	505.6351	410.0511	311.2196	205.4854	138.2602	144.2179	224.6899	349.1197	473.3950	576.5656 (97)	
Space heating kWh	62.1611	29.0375	12.0868	1.3481	0.0875	0.0000	0.0000	0.0000	0.0000	1.3835	19.7284	65.6313 (98a)	
Space heating requirement - total per year (kWh/year)												191.4642	
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	62.1611	29.0375	12.0868	1.3481	0.0875	0.0000	0.0000	0.0000	0.0000	1.3835	19.7284	65.6313 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												191.4642	
Space heating per m2										(98c) / (4) =		2.6592 (99)	

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (301)
Fraction of space heat from community system													1.0000 (302)
Fraction of heat from community Heat pump-Space													1.0000 (303a)
Fraction of heat from community Heat pump-Water													1.0000 (303b)
Factor for control and charging method (Table 4c(3)) for space heating													1.0500 (305)
Distribution loss factor (Table 12c) for community heating system													1.0000 (306)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating:													
Space heating requirement	62.1611	29.0375	12.0868	1.3481	0.0875	0.0000	0.0000	0.0000	0.0000	1.3835	19.7284	65.6313 (98)	
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00													
307a	65.2691	30.4894	12.6912	1.4155	0.0919	0.0000	0.0000	0.0000	0.0000	1.4527	20.7148	68.9128	
Space heating requirement	65.2691	30.4894	12.6912	1.4155	0.0919	0.0000	0.0000	0.0000	0.0000	1.4527	20.7148	68.9128 (307)	
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)													0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)	
Water heating													
Annual water heating requirement	202.7239	178.8858	189.3260	165.0687	158.9993	142.1980	139.6945	145.9305	148.2672	166.5905	178.6343	200.3550 (64)	
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00													
310b	202.7239	178.8858	189.3260	165.0687	158.9993	142.1980	139.6945	145.9305	148.2672	166.5905	178.6343	200.3550	
Water heating fuel	202.7239	178.8858	189.3260	165.0687	158.9993	142.1980	139.6945	145.9305	148.2672	166.5905	178.6343	200.3550 (310)	
Cooling System Energy Efficiency Ratio	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (314)	
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)	
Pumps and Fa	13.9882	12.6345	13.9882	13.5370	13.9882	13.5370	13.9882	13.9882	13.5370	13.9882	13.5370	13.9882 (331)	
Lighting	23.7828	19.0794	17.1789	12.5860	9.7218	7.9428	8.8685	11.5277	14.9733	19.6458	22.1899	24.4438 (332)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-11.9294	-18.2807	-28.5954	-35.0838	-40.4655	-38.7721	-38.2896	-34.7952	-29.1421	-22.1078	-13.6202	-10.1482 (333a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)	
Annual totals kWh/year													
Space heating fuel - community heating													201.0374 (307)
Space heating fuel - secondary													0.0000 (309)
Water heating fuel - community heating													2016.6737 (310)
Efficiency of water heater													0.0000 (311)
Electricity used for heat distribution (space)													2.0104 (313)
Electricity used for heat distribution (water)													2.0035 (313)
Space cooling fuel													0.0000 (321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)													
mechanical ventilation fans (SFP = 0.7500)													164.7000 (330a)
Total electricity for the above, kWh/year													164.7000 (331)
Electricity for lighting (calculated in Appendix L)													191.9407 (332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-321.2299 (333)
Wind generation													0.0000 (334)
Hydro-electric generation (Appendix N)													0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)													0.0000 (335)
Appendix Q - special features													
Energy saved or generated													-0.0000 (336)
Energy used													0.0000 (337)
Total delivered energy for all uses													2253.1219 (338)

12b. Carbon dioxide emissions - Community heating scheme

Energy	Emission factor	Emissions
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	kWh/year	kg CO2/kWh	kg CO2/year
Efficiency of heat source Heat pump			330.0000 (367)
Space heating from Heat pump	60.9204	0.1603	9.7672 (367)
Efficiency of heat source Heat pump			440.0000 (367)
Water heating from Heat pump	458.3349	0.0000	0.0000 (368)
Electrical energy for heat distribution (space & water)	2.0104	0.0000	3.1675 (372)
Overall CO2 factor for heat network (space)			0.0502 (386)
Overall CO2 factor for heat network (water)			0.0335 (386)
Total CO2 associated with community systems			77.5974 (373)
Space and water heating			77.5974 (376)
Pumps, fans and electric keep-hot	164.7000	0.1387	22.8459 (378)
Energy for lighting	191.9407	0.1443	27.7030 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-321.2299	0.1329	-42.6756
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-42.6756 (380)
Total CO2, kg/year			85.4707 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.1900 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			330.0000 (467a)
Space heating from Heat pump	60.9204	1.5934	97.0689 (467)
Efficiency of heat source Heat pump			440.0000 (467b)
Water heating from Heat pump	458.3349	0.0000	0.0000 (468)
Electrical energy for heat distribution (space & water)	2.0104	0.0000	33.8906 (472)
Overall CO2 factor for heat network (space)			0.4988 (486)
Overall CO2 factor for heat network (water)			0.3611 (486)
Total CO2 associated with community systems			828.3977 (473)
Space and water heating			828.3977 (476)
Pumps, fans and electric keep-hot	164.7000	1.5128	249.1582 (478)
Energy for lighting	191.9407	1.5338	294.4051 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-321.2299	1.4909	-478.9195
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-478.9195 (480)
Total Primary energy kWh/year			893.0414 (483)
Dwelling Primary energy Rate (DPER)			12.4000 (484)

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	72.0000	2.5000	180.0000
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.0000		
Dwelling volume			

2. Ventilation rate

		m3 per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1667 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4167 (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) =	0.3542 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000	(22)
Wind factor	1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 0.9500 0.9250 1.0000 1.0750 1.1250 1.1750	(22a)
Adj infilt rate	0.4516 0.4427 0.4339 0.3896 0.3807 0.3365 0.3365 0.3276 0.3542 0.3807 0.3984 0.4161	(22b)
Effective ac	0.6020 0.5980 0.5941 0.5759 0.5725 0.5566 0.5566 0.5537 0.5627 0.5725 0.5794 0.5866	(25)

3. Heat losses and heat loss parameter

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Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K						
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K						
TER Opening Type			12.8800	1.1450	14.7481			(27)					
External Wall 1	42.5000	12.8800	29.6200	0.1800	5.3316			(29a)					
Total net area of external elements Aum(A, m2)			42.5000					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)... (30) + (32) =			20.0797		(33)					
Main dwelling													
Party Wall hall			42.5000	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								223.0722 (35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				34.0000	0.0000	0.0000							
E7 Party floor between dwellings (in blocks of flats)				34.0000	0.0700	2.3800							
E1 Steel lintel with perforated steel base plate				6.1000	0.0500	0.3050							
E3 Sill				6.1000	0.0500	0.3050							
E4 Jamb				16.5600	0.0500	0.8280							
E16 Corner (normal)				2.5000	0.0900	0.2250							
E18 Party wall between dwellings				5.0000	0.0600	0.3000							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								4.3430 (36)					
Point Thermal bridges						(36a) =		0.0000					
Total fabric heat loss						(33) + (36) + (36a) =		24.4227 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	35.7561	35.5209	35.2904	34.2077	34.0052	33.0622	33.0622	32.8875	33.4254	34.0052	34.4149	34.8434	(38)
Average = Sum(39)m / 12 =	60.1788	59.9436	59.7131	58.6304	58.4278	57.4849	57.4849	57.3102	57.8481	58.4278	58.8376	59.2661	(39)
												58.6294	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.8358	0.8326	0.8293	0.8143	0.8115	0.7984	0.7984	0.7960	0.8034	0.8115	0.8172	0.8231	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

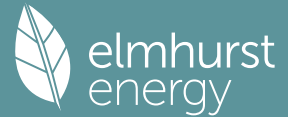
Assumed occupancy													2.2937 (42)
Hot water usage for mixer showers													
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for other uses	72.2582	71.1851	69.6739	66.8875	64.8011	62.4876	61.2380	62.7386	64.3725	66.8480	69.6918	72.0139	(42b)
Average daily hot water use (litres/day)	38.1196	36.7335	35.3473	33.9611	32.5749	31.1888	31.1888	32.5749	33.9611	35.3473	36.7335	38.1196	(42c)
												101.6490	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	110.3779	107.9185	105.0212	100.8486	97.3760	93.6764	92.4267	95.3135	98.3336	102.1953	106.4252	110.1336	(44)
Energy content (annual)	174.8115	153.6746	161.4136	138.0567	131.0869	115.1860	111.7821	118.0181	121.2552	138.6781	151.6223	172.4426	(45)
Distribution loss (46)m = 0.15 x (45)m	26.2217	23.0512	24.2120	20.7085	19.6630	17.2779	16.7673	17.7027	18.1883	20.8017	22.7433	25.8664	(46)
Water storage loss (or HIU loss):													
Store volume													15.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													0.4337 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.2342 (55)
Total storage loss	7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595	(56)
If cylinder contains dedicated solar storage	7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	205.3335	181.2428	191.9356	167.5941	161.6088	144.7234	142.3041	148.5400	150.7925	169.2000	181.1596	202.9645	(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	205.3335	181.2428	191.9356	167.5941	161.6088	144.7234	142.3041	148.5400	150.7925	169.2000	181.1596	202.9645	(64)
12Total per year (kWh/year)													2047.3988 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month	82.5424	73.1513	78.0876	69.5337	68.0039	61.9292	61.5851	63.6586	63.9472	70.5280	74.0443	81.7547	(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	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.1237	115.2799	104.1237	107.5945	104.1237	107.5945	104.1237	104.1237	107.5945	104.1237	107.5945	104.1237	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.9192	204.0145	198.7344	187.4938	173.3045	159.9686	151.0594	148.9641	154.2442	165.4848	179.6741	193.0100	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	(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)	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	(71)
Water heating gains (Table 5)	110.9441	108.8562	104.9564	96.5746	91.4031	86.0128	82.7757	85.5626	88.8156	94.7957	102.8393	109.8853	(72)
Total internal gains	477.3922	488.5558	468.2198	452.0682	429.2366	410.9812	395.3641	396.0557	408.0596	424.8095	450.5131	467.4243	(73)

6. Solar gains

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[Jan]				Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b		g	Specific data or Table 6c	FF	Access factor Table 6d		Gains W
Southwest				8.5900	36.7938			0.6300		0.7000	0.7700		96.5917 (79)
Northwest				4.2900	11.2829			0.6300		0.7000	0.7700		14.7928 (81)
Solar gains	111.3846	194.6427	279.3700	368.0291	432.1907	437.8483	418.4774	369.2672	309.8620	218.6407	134.3079	94.7430 (83)	
Total gains	588.7768	683.1985	747.5899	820.0973	861.4273	848.8296	813.8415	765.3229	717.9215	643.4502	584.8210	562.1673 (84)	
7. Mean internal temperature (heating season)													
Temperature during heating periods in the living area from Table 9, Th1 (C)													
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	21.0000 (85)
tau	74.1365	74.4274	74.7147	76.0944	76.3582	77.6108	77.6108	77.8473	77.1235	76.3582	75.8264	75.2782	
alpha	5.9424	5.9618	5.9810	6.0730	6.0905	6.1741	6.1741	6.1898	6.1416	6.0905	6.0551	6.0185	
util living area	0.9823	0.9591	0.9115	0.7896	0.6162	0.4320	0.3106	0.3442	0.5492	0.8332	0.9587	0.9858 (86)	
MIT	20.2594	20.4617	20.6794	20.8921	20.9780	20.9979	20.9998	20.9996	20.9914	20.8752	20.5518	20.2315 (87)	
Th 2	20.2224	20.2252	20.2280	20.2409	20.2434	20.2547	20.2547	20.2568	20.2503	20.2434	20.2385	20.2333 (88)	
util rest of house	0.9779	0.9497	0.8931	0.7553	0.5705	0.3823	0.2581	0.2887	0.4922	0.7961	0.9478	0.9822 (89)	
MIT 2	19.3705	19.6238	19.8887	20.1391	20.2261	20.2535	20.2546	20.2567	20.2449	20.1288	19.7492	19.3442 (90)	
Living area fraction	19.6915	19.9264	20.1742	20.4110	20.4976	20.5223	20.5237	20.5249	20.5145	fLA = Living area / (4) =	20.0390	0.3611 (91)	
MIT	19.6915	19.9264	20.1742	20.4110	20.4976	20.5223	20.5237	20.5249	20.5145	20.3984	20.0390	19.6646 (92)	
Temperature adjustment	19.6915	19.9264	20.1742	20.4110	20.4976	20.5223	20.5237	20.5249	20.5145	20.3984	20.0390	0.0000	
adjusted MIT	19.6915	19.9264	20.1742	20.4110	20.4976	20.5223	20.5237	20.5249	20.5145	20.3984	20.0390	19.6646 (93)	
8. Space heating requirement													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9742	0.9456	0.8917	0.7633	0.5861	0.4002	0.2771	0.3087	0.5125	0.8042	0.9444	0.9789 (94)	
Useful gains	573.5975	646.0206	666.5901	625.9725	504.8590	339.7189	225.4951	236.2877	367.9250	517.4832	552.3053	550.3140 (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	926.2406	900.7358	816.5312	674.8936	514.0254	340.4439	225.5542	236.4012	371.0663	572.4965	761.3014	916.5262 (97)	
Space heating kWh	262.3664	171.1686	111.5562	35.2232	6.8198	0.0000	0.0000	0.0000	0.0000	40.9299	150.4772	272.4619 (98a)	
Space heating requirement - total per year (kWh/year)												1051.0032	
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	262.3664	171.1686	111.5562	35.2232	6.8198	0.0000	0.0000	0.0000	0.0000	40.9299	150.4772	272.4619 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1051.0032	
Space heating per m2										(98c) / (4) =		14.5973 (99)	
9a. Energy requirements - Individual heating systems, including micro-CHP													
Fraction of space heat from secondary/supplementary system (Table 11)													
Fraction of space heat from main system(s)													0.0000 (201)
Fraction of main heating from main system 2													1.0000 (202)
Fraction of total heating from main system 1													0.0000 (203)
Fraction of total heating from main system 2													1.0000 (204)
Efficiency of main space heating system 1 (in %)													0.0000 (205)
Efficiency of main space heating system 2 (in %)													92.3000 (206)
Efficiency of secondary/supplementary heating system, %													88.8000 (207)
													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	262.3664	171.1686	111.5562	35.2232	6.8198	0.0000	0.0000	0.0000	0.0000	40.9299	150.4772	272.4619 (98)	
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)	
Space heating fuel (main heating system)	284.2540	185.4481	120.8626	38.1616	7.3888	0.0000	0.0000	0.0000	0.0000	44.3444	163.0305	295.1917 (211)	
Space heating efficiency (main heating system 2)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)	
Space heating fuel used, main system 2												0.0000 (213)	
Water heating													
Water heating requirement	205.3335	181.2428	191.9356	167.5941	161.6088	144.7234	142.3041	148.5400	150.7925	169.2000	181.1596	202.9645 (64)	
Efficiency of water heater (217)m	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000 (216)	
Fuel for water heating, kWh/month	257.3101	227.1213	240.5208	210.0176	202.5173	181.3576	178.3259	186.1404	188.9631	212.0301	227.0171	254.3415 (219)	
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	11.1260	10.0493	11.1260	10.7671	11.1260	10.7671	11.1260	11.1260	10.7671	11.1260	10.7671	11.1260 (231)	
Lighting	21.6349	17.3563	15.6274	11.4493	8.8438	7.2254	8.0676	10.4866	13.6210	17.8715	20.1858	22.2362 (232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-8.6803	-13.4248	-21.1460	-26.1309	-30.3302	-29.1205	-28.7743	-26.0757	-21.7398	-16.3332	-9.9565	-7.3732 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-1.8619	-4.0787	-8.4200	-13.1237	-17.8331	-18.0923	-17.8737	-14.9051	-10.6356	-5.9773	-2.5309	-1.4603 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

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(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1138.6817	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2565.6626	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												131.0000	(231)
Electricity for lighting (calculated in Appendix L)												174.6057	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-355.8780	(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												3654.0720	(238)

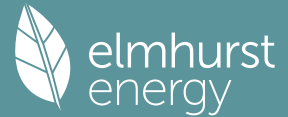
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1138.6817	0.2100	239.1232 (261)
Space heating - main system 2	0.0000	0.2100	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2565.6626	0.2100	538.7892 (264)
Space and water heating			777.9123 (265)
Pumps, fans and electric keep-hot	131.0000	0.1387	18.1713 (267)
Energy for lighting	174.6057	0.1443	25.2010 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-239.0855	0.1327	-31.7262
PV Unit electricity exported	-116.7925	0.1248	-14.5803
Total			-46.3065 (269)
Total CO2, kg/year			774.9781 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.7600 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1138.6817	1.1300	1286.7103 (275)
Space heating - main system 2	0.0000	1.1300	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2565.6626	1.1300	2899.1988 (278)
Space and water heating			4185.9091 (279)
Pumps, fans and electric keep-hot	131.0000	1.5128	198.1768 (281)
Energy for lighting	174.6057	1.5338	267.8160 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-239.0855	1.4903	-356.3142
PV Unit electricity exported	-116.7925	0.4582	-53.5137
Total			-409.8279 (283)
Total Primary energy kWh/year			4242.0740 (286)
Target Primary Energy Rate (TPER)			58.9200 (287)

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Plot Reference	07flr sample 2 Plot 20				Issued on Date	13/12/2025	
Assessment Reference	Block E 1B2P			Plot Type Ref	Block E 1B2P		
Plot Address					SAP Version	10.2	
SAP Rating	87 B	DER	1.16	TER	11.39		
Environmental	99 A	% DER < TER				89.82	
CO ₂ Emissions (t/year)	0.06	DFEE	11.47	TFEE	14.19		
Compliance Check	See BREL	% DFEE < TFEE				19.16	
% DPER < TPER	80.77	DPER	12.16	TPER	63.25		
Assessor Details	Mr. Andrew Jones				Assessor ID	N955-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	50.0000 (1b)	2.5000 (2b)	125.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	125.0000 (5)

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes		
Pressure Test Method	Blower Door		
Measured/design AP50	3.0000		(17)
Infiltration rate	0.1500		(18)
Number of sides sheltered	3		(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												86.4000 (23c)
Effective ac	0.2162	0.2133	0.2104	0.1959	0.1930	0.1784	0.1784	0.1755	0.1842	0.1930	0.1988	0.2046 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows Open			4.2900	1.1450	4.9122		(27)
External Wall 1	17.5000	4.2900	13.2100	0.1500	1.9815	70.0000	924.7000 (29a)
Total net area of external elements A _{um} (A, m ²)			17.5000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		6.8937		(33)
Main dwelling							
Party Wall hall			55.0000	0.0000	0.0000	180.0000	9900.0000 (32)
Party Floor 1			50.0000			40.0000	2000.0000 (32a)
Party Ceiling 1			50.0000			30.0000	1500.0000 (32b)
Internal Wall 1			84.4500			9.0000	760.0500 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	15084.7500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							301.6950 (35)
Thermal bridges (User defined value 0.075 * total exposed area)							1.3125 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	8.2062 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	8.9190	8.7991	8.6793	8.0798	7.9600	7.3605	7.3605	7.2407	7.6003	7.9600	8.1997	8.4395	(38)
Heat transfer coeff	17.1252	17.0054	16.8855	16.2861	16.1662	15.5668	15.5668	15.4469	15.8065	16.1662	16.4059	16.6457	(39)
Average = Sum(39)m / 12 =												16.2561	
HLP	0.3425	0.3401	0.3377	0.3257	0.3233	0.3113	0.3113	0.3089	0.3161	0.3233	0.3281	0.3329	(40)
HLP (average)												0.3251	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6901	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	60.5412	59.6421	58.3759	56.0413	54.2933	52.3549	51.3079	52.5652	53.9342	56.0083	58.3909	60.3365	60.3365	(42b)
Hot water usage for other uses	31.9383	30.7769	29.6155	28.4541	27.2927	26.1314	26.1314	27.2927	28.4541	29.6155	30.7769	31.9383	31.9383	(42c)
Average daily hot water use (litres/day)													85.1660	(43)
Daily hot water use	92.4795	90.4190	87.9914	84.4955	81.5860	78.4863	77.4393	79.8580	82.3883	85.6238	89.1678	92.2748	92.2748	(44)
Energy content (annual)	146.4649	128.7554	135.2396	115.6701	109.8304	96.5080	93.6561	98.8808	101.5930	116.1907	127.0359	144.4801	144.4801	(45)
Distribution loss (46)m = 0.15 x (45)m	21.9697	19.3133	20.2859	17.3505	16.4746	14.4762	14.0484	14.8321	15.2390	17.4286	19.0554	21.6720	21.6720	(46)
Water storage loss (or HIU loss):													15.0000	(47)
Store volume													0.2500	(48)
a) If manufacturer declared loss factor is known (kWh/day):													0.6000	(49)
Temperature factor from Table 2b													0.1500	(55)
Enter (49) or (54) in (55)														
Total storage loss	4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	(56)
If cylinder contains dedicated solar storage	4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	174.3773	153.9666	163.1520	142.6821	137.7428	123.5200	121.5685	126.7932	128.6050	144.1031	154.0479	172.3925	172.3925	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	174.3773	153.9666	163.1520	142.6821	137.7428	123.5200	121.5685	126.7932	128.6050	144.1031	154.0479	172.3925	172.3925	(64)
12Total per year (kWh/year)													1742.9511	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000	(64a)
Heat gains from water heating, kWh/month	71.0295	62.9801	67.2971	60.0699	58.8485	53.6985	53.4706	55.2078	55.3893	60.9633	63.8490	70.3695	70.3695	(65)

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

Metabolic gains (Table 5), Watts														
(66)m	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	91.0186	100.7706	91.0186	94.0525	91.0186	94.0525	91.0186	91.0186	94.0525	91.0186	94.0525	91.0186	91.0186	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.2339	148.7618	144.9117	136.7153	126.3689	116.6447	110.1484	108.6205	112.4706	120.6670	131.0134	140.7376	140.7376	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	(71)
Water heating gains (Table 5)	95.4698	93.7204	90.4531	83.4304	79.0975	74.5813	71.8690	74.2040	76.9296	81.9400	88.6792	94.5827	94.5827	(72)
Total internal gains	382.0738	391.6043	374.7349	362.5498	344.8365	333.6301	321.3875	322.1947	331.8042	341.9770	362.0967	374.6904	374.6904	(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	

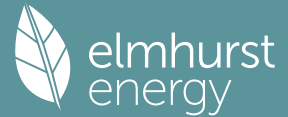
Northwest					4.2900	11.2829		0.4000	0.6000	0.7700		8.0505 (81)	

Solar gains		8.0505	16.3871	29.5243	48.4874	65.1765	69.4851	65.0019	51.8202	35.9758	20.0263	10.1296	6.5745 (83)
Total gains		390.1243	407.9914	404.2592	411.0372	410.0131	403.1151	386.3894	374.0149	367.7801	362.0033	372.2263	381.2649 (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	244.6803	246.4052	248.1547	257.2881	259.1960	269.1766	269.1766	271.2657	265.0936	259.1960	255.4080	251.7291	251.7291	(86)
Feb	17.3120	17.4270	17.5436	18.1525	18.2797	18.9451	18.9451	19.0844	18.6729	18.2797	18.0272	17.7819	17.7819	
util living area	0.7322	0.6708	0.6056	0.4794	0.3667	0.2471	0.1773	0.1900	0.2965	0.4644	0.6126	0.7327	0.7327	(86)

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MIT	20.9993	20.9998	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	20.9994 (87)
Th 2	20.6673	20.6695	20.6718	20.6831	20.6854	20.6967	20.6967	20.6990	20.6922	20.6854	20.6809	20.6763 (88)
util rest of house	0.7178	0.6571	0.5919	0.4669	0.3543	0.2354	0.1650	0.1776	0.2833	0.4504	0.5986	0.7188 (89)
MIT 2	20.6667	20.6694	20.6718	20.6831	20.6854	20.6967	20.6967	20.6990	20.6922	20.6854	20.6808	20.6759 (90)
Living area fraction	MIT	20.8396	20.8412	20.8424	20.8479	20.8490	20.8544	20.8555	20.8523	20.8490	20.8468	0.5200 (91)
Temperature adjustment	adjusted MIT	20.8396	20.8412	20.8424	20.8479	20.8490	20.8544	20.8555	20.8523	20.8490	20.8468	20.8441 (92)
												0.0000
												20.8441 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.7253	0.6643	0.5990	0.4734	0.3607	0.2415	0.1714	0.1840	0.2902	0.4577	0.6059	0.7260	(94)
Useful gains	282.9404	271.0128	242.1667	194.5840	147.9041	97.3613	66.2278	68.8240	106.7297	165.6868	225.5183	276.7927	(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	283.2453	271.0861	242.1788	194.5841	147.9041	97.3613	66.2278	68.8240	106.7297	165.6869	225.5290	277.0524	(97)
Space heating kWh	0.2268	0.0493	0.0090	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0076	0.1933	(98a)
Space heating requirement - total per year (kWh/year)												0.4861	
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	0.2268	0.0493	0.0090	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0076	0.1933	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												0.4861	
Space heating per m2											(98c) / (4) =	0.0097	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (301)
Fraction of space heat from community system													1.0000 (302)
Fraction of heat from community Heat pump-Space													1.0000 (303a)
Fraction of heat from community Heat pump-Water													1.0000 (303b)
Factor for control and charging method (Table 4c(3)) for space heating													1.0500 (305)
Distribution loss factor (Table 12c) for community heating system													1.0000 (306)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating:													
Space heating requirement	0.2268	0.0493	0.0090	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0076	0.1933	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00													
307a	0.2381	0.0517	0.0095	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0080	0.2029	
Space heating requirement	0.2381	0.0517	0.0095	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0080	0.2029	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)													0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	174.3773	153.9666	163.1520	142.6821	137.7428	123.5200	121.5685	126.7932	128.6050	144.1031	154.0479	172.3925	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00													
310b	174.3773	153.9666	163.1520	142.6821	137.7428	123.5200	121.5685	126.7932	128.6050	144.1031	154.0479	172.3925	
Water heating fuel	174.3773	153.9666	163.1520	142.6821	137.7428	123.5200	121.5685	126.7932	128.6050	144.1031	154.0479	172.3925	(310)
Cooling System Energy Efficiency Ratio													0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	9.7140	8.7740	9.7140	9.4007	9.7140	9.4007	9.7140	9.7140	9.4007	9.7140	9.4007	9.7140	(331)
Lighting	20.1986	16.2041	14.5900	10.6892	8.2567	6.7458	7.5320	9.7904	12.7168	16.6851	18.8458	20.7600	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-11.4996	-17.3800	-26.8102	-32.4196	-36.9754	-35.2876	-34.8713	-31.9100	-27.0256	-20.8500	-13.0545	-9.8098	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												0.5104	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												1742.9511	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution (space)												0.0051	(313)
Electricity used for heat distribution (water)												1.7239	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)													
mechanical ventilation fans (SFP = 0.7500)													114.3750 (330a)
Total electricity for the above, kWh/year													114.3750 (331)
Electricity for lighting (calculated in Appendix L)													163.0145 (332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-297.8938 (333)
Wind generation													0.0000 (334)
Hydro-electric generation (Appendix N)													0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)													0.0000 (335)
Appendix Q - special features													
Energy saved or generated													-0.0000 (336)
Energy used													0.0000 (337)
Total delivered energy for all uses													1722.9572 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
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Efficiency of heat source Heat pump			330.0000 (367)
Space heating from Heat pump	0.1547	0.1623	0.0251 (367)
Efficiency of heat source Heat pump			440.0000 (367)
Water heating from Heat pump	396.1252	0.0000	0.0000 (368)
Electrical energy for heat distribution (space & water)	0.0051	0.0000	2.4586 (372)
Overall CO2 factor for heat network (space)			0.0508 (386)
Overall CO2 factor for heat network (water)			0.0335 (386)
Total CO2 associated with community systems			58.3410 (373)
Space and water heating			58.3410 (376)
Pumps, fans and electric keep-hot	114.3750	0.1387	15.8652 (378)
Energy for lighting	163.0145	0.1443	23.5280 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-297.8938	0.1331	-39.6561
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-39.6561 (380)
Total CO2, kg/year			58.0782 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.1600 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			330.0000 (467a)
Space heating from Heat pump	0.1547	1.6005	0.2476 (467)
Efficiency of heat source Heat pump			440.0000 (467b)
Water heating from Heat pump	396.1252	0.0000	0.0000 (468)
Electrical energy for heat distribution (space & water)	0.0051	0.0000	26.5255 (472)
Overall CO2 factor for heat network (space)			0.5010 (486)
Overall CO2 factor for heat network (water)			0.3610 (486)
Total CO2 associated with community systems			629.4407 (473)
Space and water heating			629.4407 (476)
Pumps, fans and electric keep-hot	114.3750	1.5128	173.0265 (478)
Energy for lighting	163.0145	1.5338	250.0371 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-297.8938	1.4919	-444.4309
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-444.4309 (480)
Total Primary energy kWh/year			608.0734 (483)
Dwelling Primary energy Rate (DPER)			12.1600 (484)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	50.0000	2.5000	125.0000
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000		
Dwelling volume			

2. Ventilation rate

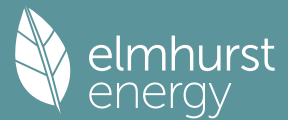
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1600 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4100 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (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	0.4051	0.3972	0.3892	0.3495	0.3416	0.3019	0.3019	0.2939	0.3178	0.3416	0.3575	0.3734 (22b)
Effective ac	0.5821	0.5789	0.5758	0.5611	0.5583	0.5456	0.5456	0.5432	0.5505	0.5583	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
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Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K						
TER Opening Type			4.2900	1.1450	4.9122		(27)						
External Wall 1	17.5000	4.2900	13.2100	0.1800	2.3778		(29a)						
Total net area of external elements Aum(A, m2)			17.5000				(31)						
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		7.2900		(33)						
Main dwelling													
Party Wall hall			55.0000	0.0000	0.0000		(32)						
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							301.6950 (35)						
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				44.0000	0.0000	0.0000							
E7 Party floor between dwellings (in blocks of flats)				14.0000	0.0700	0.9800							
E1 Steel lintel with perforated steel base plate				3.8000	0.0500	0.1900							
E3 Sill				3.8000	0.0500	0.1900							
E4 Jamb				8.2000	0.0500	0.4100							
E18 Party wall between dwellings				10.0000	0.0600	0.6000							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							2.3700 (36)						
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	9.6600 (37)						
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	24.0102	23.8788	23.7499	23.1447	23.0315	22.5044	22.5044	22.4068	22.7074	23.0315	23.2605	23.5000	(38)
Average = Sum(39)m / 12 =	33.6702	33.5388	33.4099	32.8047	32.6915	32.1644	32.1644	32.0668	32.3674	32.6915	32.9206	33.1600	(39)
												32.8042	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.6734	0.6708	0.6682	0.6561	0.6538	0.6433	0.6433	0.6413	0.6473	0.6538	0.6584	0.6632	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6901 (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													
	60.5412	59.6421	58.3759	56.0413	54.2933	52.3549	51.3079	52.5652	53.9342	56.0083	58.3909	60.3365	(42b)
Hot water usage for other uses													
	31.9383	30.7769	29.6155	28.4541	27.2927	26.1314	26.1314	27.2927	28.4541	29.6155	30.7769	31.9383	(42c)
Average daily hot water use (litres/day)													85.1660 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	92.4795	90.4190	87.9914	84.4955	81.5860	78.4863	77.4393	79.8580	82.3883	85.6238	89.1678	92.2748	(44)
Energy conte	146.4649	128.7554	135.2396	115.6701	109.8304	96.5080	93.6561	98.8808	101.5930	116.1907	127.0359	144.4801	(45)
Energy content (annual)										Total = Sum(45)m =		1414.3051	
Distribution loss (46)m = 0.15 x (45)m													
	21.9697	19.3133	20.2859	17.3505	16.4746	14.4762	14.0484	14.8321	15.2390	17.4286	19.0554	21.6720	(46)
Water storage loss (or HIU loss):													
Store volume													15.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													0.4337 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.2342 (55)
Total storage loss													
	7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595	(56)
If cylinder contains dedicated solar storage													
	7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	176.9868	156.3236	165.7615	145.2074	140.3524	126.0454	124.1780	129.4027	131.1304	146.7126	156.5733	175.0020	(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													
	176.9868	156.3236	165.7615	145.2074	140.3524	126.0454	124.1780	129.4027	131.1304	146.7126	156.5733	175.0020	(64)
12Total per year (kWh/year)													1773.6762 (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													
	73.1171	64.8657	69.3847	62.0902	60.9362	55.7188	55.5582	57.2954	57.4096	63.0509	65.8693	72.4572	(65)

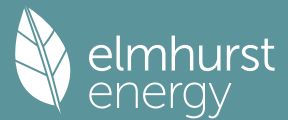
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	88.4561	97.9335	88.4561	91.4046	88.4561	91.4046	88.4561	88.4561	91.4046	88.4561	91.4046	88.4561	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	147.2339	148.7618	144.9117	136.7153	126.3689	116.6447	110.1484	108.6205	112.4706	120.6670	131.0134	140.7376	(68)
Pumps, fans	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	(69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Water heating gains (Table 5)	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	(71)
Total internal gains	98.2757	96.5264	93.2590	86.2364	81.9034	77.3872	74.6750	77.0100	79.7355	84.7459	91.4852	97.3887	(72)
	385.3172	394.5732	377.9783	365.7078	348.0800	333.7881	321.6310	322.4381	331.9623	345.2205	365.2547	377.9339	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W
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		W/m2		or Table 6b		or Table 6c		Table 6d						
Northwest		4.2900		11.2829		0.6300		0.7000		0.7700		14.7928 (81)		
Solar gains	14.7928	30.1112	54.2509	89.0955	119.7619	127.6789	119.4409	95.2197	66.1056	36.7983	18.6132	12.0806	(83)	
Total gains	400.1101	424.6844	432.2292	454.8034	467.8418	461.4669	441.0719	417.6578	398.0678	382.0188	383.8679	390.0144	(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	124.4485	124.9363	125.4181	127.7319	128.1743	130.2748	130.2748	130.6714	129.4576	128.1743	127.2824	126.3632		
alpha	9.2966	9.3291	9.3612	9.5155	9.5450	9.6850	9.6850	9.7114	9.6305	9.5450	9.4855	9.4242		
util living area	0.9874	0.9752	0.9465	0.8328	0.6461	0.4460	0.3209	0.3532	0.5601	0.8445	0.9638	0.9893	(86)	
MIT	20.6670	20.7493	20.8499	20.9637	20.9965	20.9999	21.0000	21.0000	20.9992	20.9653	20.8251	20.6584	(87)	
Th 2	20.3644	20.3667	20.3690	20.3798	20.3818	20.3912	20.3912	20.3929	20.3876	20.3818	20.3777	20.3735	(88)	
util rest of house	0.9835	0.9679	0.9318	0.8006	0.6046	0.4036	0.2765	0.3066	0.5109	0.8076	0.9522	0.9859	(89)	
MIT 2	19.9878	20.0914	20.2140	20.3478	20.3794	20.3912	20.3912	20.3929	20.3872	20.3529	20.1944	19.9849	(90)	
Living area fraction	20.3410	20.4335	20.5446	20.6681	20.7003	20.7077	20.7078	20.7086	fLA = Living area / (4) =			0.5200	(91)	
MIT	20.3410	20.4335	20.5446	20.6681	20.7003	20.7077	20.7078	20.7086	20.7055	20.6713	20.5223	20.3352	(92)	
Temperature adjustment												0.0000		
adjusted MIT	20.3410	20.4335	20.5446	20.6681	20.7003	20.7077	20.7078	20.7086	20.7055	20.6713	20.5223	20.3352	(93)	
8. Space heating requirement														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	0.9833	0.9687	0.9362	0.8160	0.6261	0.4256	0.2996	0.3308	0.5365	0.8255	0.9552	0.9857	(94)	
Useful gains	393.4308	411.4121	404.6596	371.1153	292.9168	196.4217	132.1232	138.1611	213.5523	315.3423	366.6730	384.4359	(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	540.1035	520.9761	469.2305	386.0486	294.2321	196.4506	132.1240	138.1631	213.8014	329.2469	441.8709	535.0423	(97)	
Space heating kWh	109.1245	73.6270	48.0408	10.7520	0.9785	0.0000	0.0000	0.0000	0.0000	10.3450	54.1425	112.0512	(98a)	
Space heating requirement - total per year (kWh/year)												419.0614		
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	109.1245	73.6270	48.0408	10.7520	0.9785	0.0000	0.0000	0.0000	0.0000	10.3450	54.1425	112.0512	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												419.0614		
Space heating per m2										(98c) / (4) =		8.3812	(99)	
9a. Energy requirements - Individual heating systems, including micro-CHP														
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)		
Fraction of space heat from main system(s)												1.0000 (202)		
Fraction of main heating from main system 2												0.0000 (203)		
Fraction of total heating from main system 1												1.0000 (204)		
Fraction of total heating from main system 2												0.0000 (205)		
Efficiency of main space heating system 1 (in %)												92.3000 (206)		
Efficiency of main space heating system 2 (in %)												88.8000 (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	109.1245	73.6270	48.0408	10.7520	0.9785	0.0000	0.0000	0.0000	0.0000	10.3450	54.1425	112.0512	(98)	
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)	
Space heating fuel (main heating system)	118.2281	79.7692	52.0485	11.6489	1.0602	0.0000	0.0000	0.0000	0.0000	11.2081	58.6592	121.3989	(211)	
Space heating efficiency (main heating system 2)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000	(212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)	
Water heating														
Water heating requirement												175.0020 (64)		
Efficiency of water heater (217)m	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	(216)	
Fuel for water heating, kWh/month	221.7880	195.8943	207.7212	181.9642	175.8802	157.9516	155.6115	162.1588	164.3238	183.8504	196.2071	219.3008	(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	11.1260	10.0493	11.1260	10.7671	11.1260	10.7671	11.1260	11.1260	10.7671	11.1260	10.7671	11.1260	(231)	
Lighting	18.3794	14.7447	13.2759	9.7265	7.5130	6.1382	6.8536	8.9086	11.5714	15.1823	17.1484	18.8902	(232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-6.0820	-9.4354	-14.9076	-18.4822	-21.5120	-20.6841	-20.4499	-18.5120	-15.3948	-11.5158	-6.9895	-5.1638	(233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)	
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-1.2390	-2.7198	-5.6244	-8.7780	-11.9347	-12.1026	-11.9445	-9.9469	-7.0881	-3.9775	-1.6823	-0.9706	(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												454.0211 (211)		

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Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2222.6518	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	131.0000	(231)
Electricity for lighting (calculated in Appendix L)	148.3325	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-247.1375	(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	2708.8679	(238)

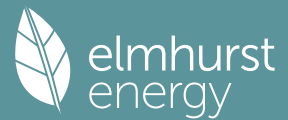
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	454.0211	0.2100	95.3444 (261)
Space heating - main system 2	0.0000	0.2100	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2222.6518	0.2100	466.7569 (264)
Space and water heating			562.1013 (265)
Pumps, fans and electric keep-hot	131.0000	0.1387	18.1713 (267)
Energy for lighting	148.3325	0.1443	21.4090 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-169.1293	0.1326	-22.4313
PV Unit electricity exported	-78.0082	0.1248	-9.7374
Total			-32.1687 (269)
Total CO2, kg/year			569.5129 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.3900 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	454.0211	1.1300	513.0438 (275)
Space heating - main system 2	0.0000	1.1300	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2222.6518	1.1300	2511.5966 (278)
Space and water heating			3024.6404 (279)
Pumps, fans and electric keep-hot	131.0000	1.5128	198.1768 (281)
Energy for lighting	148.3325	1.5338	227.5173 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-169.1293	1.4901	-252.0123
PV Unit electricity exported	-78.0082	0.4581	-35.7390
Total			-287.7513 (283)
Total Primary energy kWh/year			3162.5832 (286)
Target Primary Energy Rate (TPER)			63.2500 (287)

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Plot Reference	07flr sample 3 Plot 21				Issued on Date	13/12/2025	
Assessment Reference	Block E 1B2P			Plot Type Ref	Block E 1B2P		
Plot Address					SAP Version	10.2	
SAP Rating	86 B		DER	1.42		TER	14.90
Environmental	99 A		% DER < TER				90.47
CO ₂ Emissions (t/year)	0.06		DFEE	26.63		TFEE	30.89
Compliance Check	See BREL		% DFEE < TFEE				13.80
% DPER < TPER	82.09		DPER	14.66		TPER	81.85
Assessor Details	Mr. Andrew Jones				Assessor ID	N955-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	50.0000 (1b)	2.5000 (2b)	125.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	125.0000 (5)

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)

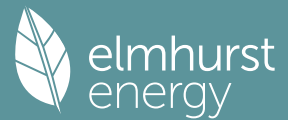
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												86.4000 (23c)
Effective ac	0.2162	0.2133	0.2104	0.1959	0.1930	0.1784	0.1784	0.1755	0.1842	0.1930	0.1988	0.2046 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows Open			7.9600	1.1450	9.1145		(27)
External Wall 1	17.5000	7.9600	9.5400	0.1500	1.4310	70.0000	667.8000 (29a)
External Roof 1	50.0000		50.0000	0.1100	5.5000	9.0000	450.0000 (30)
Total net area of external elements A _{um} (A, m ²)			67.5000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.0455		(33)
Main dwelling							
Party Wall hall			55.0000	0.0000	0.0000	180.0000	9900.0000 (32)
Party Floor 1			50.0000			40.0000	2000.0000 (32d)
Internal Wall 1			84.4500			9.0000	760.0500 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		13777.8500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							275.5570 (35)
Thermal bridges (User defined value 0.075 * total exposed area)							5.0625 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss					(33) + (36) + (36a) =		21.1080 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	8.9190	8.7991	8.6793	8.0798	7.9600	7.3605	7.3605	7.2407	7.6003	7.9600	8.1997	8.4395	(38)
Heat transfer coeff	30.0270	29.9071	29.7873	29.1878	29.0680	28.4686	28.4686	28.3487	28.7083	29.0680	29.3077	29.5475	(39)
Average = Sum(39)m / 12 =												29.1579	
HLP	0.6005	0.5981	0.5957	0.5838	0.5814	0.5694	0.5694	0.5670	0.5742	0.5814	0.5862	0.5909	(40)
HLP (average)												0.5832	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6901 (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	60.5412	59.6421	58.3759	56.0413	54.2933	52.3549	51.3079	52.5652	53.9342	56.0083	58.3909	60.3365	(42b)
Hot water usage for other uses	31.9383	30.7769	29.6155	28.4541	27.2927	26.1314	26.1314	27.2927	28.4541	29.6155	30.7769	31.9383	(42c)
Average daily hot water use (litres/day)												85.1660	(43)
Daily hot water use	92.4795	90.4190	87.9914	84.4955	81.5860	78.4863	77.4393	79.8580	82.3883	85.6238	89.1678	92.2748	(44)
Energy conte	146.4649	128.7554	135.2396	115.6701	109.8304	96.5080	93.6561	98.8808	101.5930	116.1907	127.0359	144.4801	(45)
Energy content (annual)										Total = Sum(45)m =		1414.3051	
Distribution loss (46)m = 0.15 x (45)m	21.9697	19.3133	20.2859	17.3505	16.4746	14.4762	14.0484	14.8321	15.2390	17.4286	19.0554	21.6720	(46)
Water storage loss (or HIU loss):													
Store volume												15.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2500	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.1500	(55)
Total storage loss	4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500	(56)
If cylinder contains dedicated solar storage	4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	174.3773	153.9666	163.1520	142.6821	137.7428	123.5200	121.5685	126.7932	128.6050	144.1031	154.0479	172.3925	(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	174.3773	153.9666	163.1520	142.6821	137.7428	123.5200	121.5685	126.7932	128.6050	144.1031	154.0479	172.3925	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1742.9511	(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	71.0295	62.9801	67.2971	60.0699	58.8485	53.6985	53.4706	55.2078	55.3893	60.9633	63.8490	70.3695	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.1176	88.7016	80.1176	82.7882	80.1176	82.7882	80.1176	80.1176	82.7882	80.1176	82.7882	80.1176	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.2339	148.7618	144.9117	136.7153	126.3689	116.6447	110.1484	108.6205	112.4706	120.6670	131.0134	140.7376	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	(71)
Water heating gains (Table 5)	95.4698	93.7204	90.4531	83.4304	79.0975	74.5813	71.8690	74.2040	76.9296	81.9400	88.6792	94.5827	(72)
Total internal gains	371.1728	379.5354	363.8339	351.2855	333.9355	322.3657	310.4865	311.2937	320.5399	331.0761	350.8323	363.7894	(73)

6. Solar gains

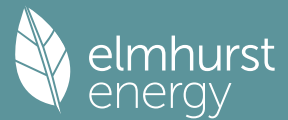
[Jan]					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
-----					Northwest	7.9600	11.2829	0.4000	0.6000	0.7700		14.9376 (81)	

Solar gains	14.9376	30.4059	54.7817	89.9672	120.9336	128.9280	120.6095	96.1513	66.7523	37.1584	18.7953	12.1988	(83)
Total gains	386.1104	409.9412	418.6155	441.2527	454.8692	451.2938	431.0961	407.4450	387.2922	368.2344	369.6277	375.9882	(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	127.4579	127.9688	128.4838	131.1224	131.6632	134.4354	134.4354	135.0039	133.3126	131.6632	130.5860	129.5264	
alpha	9.4972	9.5313	9.5656	9.7415	9.7775	9.9624	9.9624	10.0003	9.8875	9.7775	9.7057	9.6351	
util living area	0.9795	0.9607	0.9189	0.7803	0.5928	0.4037	0.2906	0.3201	0.5111	0.7967	0.9443	0.9824	(86)

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MIT	20.7305	20.8083	20.8966	20.9806	20.9985	21.0000	21.0000	21.0000	20.9997	20.9804	20.8721	20.7218 (87)
Th 2	20.4295	20.4317	20.4338	20.4446	20.4468	20.4576	20.4576	20.4598	20.4533	20.4468	20.4425	20.4382 (88)
util rest of house	0.9740	0.9512	0.9014	0.7498	0.5581	0.3695	0.2547	0.2825	0.4708	0.7615	0.9300	0.9777 (89)
MIT 2	20.1929	20.2686	20.3514	20.4313	20.4460	20.4576	20.4576	20.4598	20.4532	20.4341	20.3388	20.1924 (90)
Living area fraction									fLA = Living area / (4) =			0.5200 (91)
MIT	20.4725	20.5492	20.6349	20.7169	20.7333	20.7396	20.7397	20.7407	20.7374	20.7182	20.6161	20.4677 (92)
Temperature adjustment												0.0000
adjusted MIT	20.4725	20.5492	20.6349	20.7169	20.7333	20.7396	20.7397	20.7407	20.7374	20.7182	20.6161	20.4677 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9745	0.9533	0.9079	0.7650	0.5761	0.3873	0.2734	0.3020	0.4918	0.7791	0.9347	0.9780	(94)
Useful gains	376.2578	390.8148	380.0798	337.5541	262.0626	174.7785	117.8502	123.0528	190.4609	286.8981	345.5057	367.6995	(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	485.6110	468.0237	421.0392	344.9098	262.5794	174.7869	117.8504	123.0533	190.5480	294.1143	396.1269	480.6702	(97)
Space heating kWh	81.3588	51.8844	30.4738	5.2962	0.3845	0.0000	0.0000	0.0000	0.0000	5.3688	36.4472	84.0502	(98a)
Space heating requirement - total per year (kWh/year)												295.2639	
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	81.3588	51.8844	30.4738	5.2962	0.3845	0.0000	0.0000	0.0000	0.0000	5.3688	36.4472	84.0502	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												295.2639	
Space heating per m2										(98c) / (4) =		5.9053	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)
Fraction of space heat from community system												1.0000 (302)
Fraction of heat from community Heat pump-Space												1.0000 (303a)
Fraction of heat from community Heat pump-Water												1.0000 (303b)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500 (305)
Distribution loss factor (Table 12c) for community heating system												1.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	81.3588	51.8844	30.4738	5.2962	0.3845	0.0000	0.0000	0.0000	0.0000	5.3688	36.4472	84.0502 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00												
307a	85.4267	54.4786	31.9975	5.5610	0.4037	0.0000	0.0000	0.0000	0.0000	5.6373	38.2696	88.2527
Space heating requirement	85.4267	54.4786	31.9975	5.5610	0.4037	0.0000	0.0000	0.0000	0.0000	5.6373	38.2696	88.2527 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement	174.3773	153.9666	163.1520	142.6821	137.7428	123.5200	121.5685	126.7932	128.6050	144.1031	154.0479	172.3925 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00												
310b	174.3773	153.9666	163.1520	142.6821	137.7428	123.5200	121.5685	126.7932	128.6050	144.1031	154.0479	172.3925
Water heating fuel	174.3773	153.9666	163.1520	142.6821	137.7428	123.5200	121.5685	126.7932	128.6050	144.1031	154.0479	172.3925 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	9.7140	8.7740	9.7140	9.4007	9.7140	9.4007	9.7140	9.7140	9.4007	9.7140	9.4007	9.7140 (331)
Lighting	17.7795	14.2634	12.8426	9.4090	7.2678	5.9379	6.6299	8.6178	11.1937	14.6868	16.5887	18.2737 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-11.4813	-17.3463	-26.7544	-32.3531	-36.9056	-35.2244	-34.8011	-31.8324	-26.9518	-20.7977	-13.0289	-9.7944 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												310.0271 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												1742.9511 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution (space)												3.1003 (313)
Electricity used for heat distribution (water)												1.7239 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)												
mechanical ventilation fans (SFP = 0.7500)												114.3750 (330a)
Total electricity for the above, kWh/year												114.3750 (331)
Electricity for lighting (calculated in Appendix L)												143.4908 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-297.2713 (333)
Wind generation												0.0000 (334)
Hydro-electric generation (Appendix N)												0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (335)
Appendix Q - special features												
Energy saved or generated												-0.0000 (336)
Energy used												0.0000 (337)
Total delivered energy for all uses												2013.5727 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
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Efficiency of heat source Heat pump			330.0000 (367)
Space heating from Heat pump	93.9476	0.1591	14.9442 (367)
Efficiency of heat source Heat pump			440.0000 (367)
Water heating from Heat pump	396.1252	0.0000	0.0000 (368)
Electrical energy for heat distribution (space & water)	3.1003	0.0000	2.9509 (372)
Overall CO2 factor for heat network (space)			0.0498 (386)
Overall CO2 factor for heat network (water)			0.0335 (386)
Total CO2 associated with community systems			73.7524 (373)
Space and water heating			73.7524 (376)
Pumps, fans and electric keep-hot	114.3750	0.1387	15.8652 (378)
Energy for lighting	143.4908	0.1443	20.7102 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-297.2713	0.1331	-39.5738
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-39.5738 (380)
Total CO2, kg/year			70.7540 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.4200 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			330.0000 (467a)
Space heating from Heat pump	93.9476	1.5888	149.2662 (467)
Efficiency of heat source Heat pump			440.0000 (467b)
Water heating from Heat pump	396.1252	0.0000	0.0000 (468)
Electrical energy for heat distribution (space & water)	3.1003	0.0000	31.4432 (472)
Overall CO2 factor for heat network (space)			0.4974 (486)
Overall CO2 factor for heat network (water)			0.3610 (486)
Total CO2 associated with community systems			783.3770 (473)
Space and water heating			783.3770 (476)
Pumps, fans and electric keep-hot	114.3750	1.5128	173.0265 (478)
Energy for lighting	143.4908	1.5338	220.0910 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-297.2713	1.4919	-443.5045
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-443.5045 (480)
Total Primary energy kWh/year			732.9900 (483)
Dwelling Primary energy Rate (DPER)			14.6600 (484)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	50.0000 (1b)	2.5000 (2b)	125.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	125.0000 (5)

2. Ventilation rate

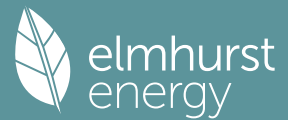
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1600 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4100 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (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	0.4051	0.3972	0.3892	0.3495	0.3416	0.3019	0.3019	0.2939	0.3178	0.3416	0.3575	0.3734 (22b)
Effective ac	0.5821	0.5789	0.5758	0.5611	0.5583	0.5456	0.5456	0.5432	0.5505	0.5583	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
---------	-------	----------	---------	---------	-------	---------	-------

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Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K
TER Opening Type			7.9600	1.1450	9.1145		(27)
External Wall 1	17.5000	7.9600	9.5400	0.1800	1.7172		(29a)
External Roof 1	50.0000		50.0000	0.1100	5.5000		(30)
Total net area of external elements Aum(A, m2)			67.5000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.3317		(33)
Main dwelling							
Party Wall hall		55.0000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 275.5570 (35)

List of Thermal Bridges							
K1 Element	Length	Psi-value	Total				
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	22.0000	0.0000	0.0000				
E7 Party floor between dwellings (in blocks of flats)	7.0000	0.0700	0.4900				
E1 Steel lintel with perforated steel base plate	3.8000	0.0500	0.1900				
E3 Sill	3.8000	0.0500	0.1900				
E4 Jamb	8.2000	0.0500	0.4100				
E18 Party wall between dwellings	10.0000	0.0600	0.6000				
E15 Flat roof with parapet	7.0000	0.5600	3.9200				
P4 Party wall - Roof (insulation at ceiling level)	22.0000	0.1200	2.6400				

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.4400 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 24.7717 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	24.0102	23.8788	23.7499	23.1447	23.0315	22.5044	22.5044	22.4068	22.7074	23.0315	23.2605	23.5000
Average = Sum(39)m / 12 =	48.7819	48.6505	48.5216	47.9164	47.8032	47.2761	47.2761	47.1785	47.4791	47.8032	48.0322	48.2717
HLP	0.9756	0.9730	0.9704	0.9583	0.9561	0.9455	0.9455	0.9436	0.9496	0.9561	0.9606	0.9654
HLP (average)												0.9583
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

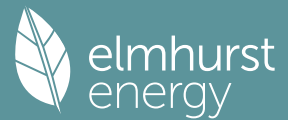
Assumed occupancy													1.6901 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	60.5412	59.6421	58.3759	56.0413	54.2933	52.3549	51.3079	52.5652	53.9342	56.0083	58.3909	60.3365	(42b)
Hot water usage for other uses	31.9383	30.7769	29.6155	28.4541	27.2927	26.1314	26.1314	27.2927	28.4541	29.6155	30.7769	31.9383	(42c)
Average daily hot water use (litres/day)													85.1660 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	92.4795	90.4190	87.9914	84.4955	81.5860	78.4863	77.4393	79.8580	82.3883	85.6238	89.1678	92.2748	(44)
Energy content (annual)	146.4649	128.7554	135.2396	115.6701	109.8304	96.5080	93.6561	98.8808	101.5930	116.1907	127.0359	144.4801	(45)
Distribution loss (46)m = 0.15 x (45)m	21.9697	19.3133	20.2859	17.3505	16.4746	14.4762	14.0484	14.8321	15.2390	17.4286	19.0554	21.6720	(46)
Water storage loss (or HIU loss):													15.0000 (47)
Store volume													0.4337 (48)
a) If manufacturer declared loss factor is known (kWh/day):													0.5400 (49)
Temperature factor from Table 2b													0.2342 (55)
Enter (49) or (54) in (55)													
Total storage loss	7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595	(56)
If cylinder contains dedicated solar storage	7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	176.9868	156.3236	165.7615	145.2074	140.3524	126.0454	124.1780	129.4027	131.1304	146.7126	156.5733	175.0020	(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	176.9868	156.3236	165.7615	145.2074	140.3524	126.0454	124.1780	129.4027	131.1304	146.7126	156.5733	175.0020	(64)
12Total per year (kWh/year)													1773.6762 (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	73.1171	64.8657	69.3847	62.0902	60.9362	55.7188	55.5582	57.2954	57.4096	63.0509	65.8693	72.4572	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	77.5536	85.8629	77.5536	80.1387	77.5536	80.1387	77.5536	77.5536	80.1387	77.5536	80.1387	77.5536	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	147.2339	148.7618	144.9117	136.7153	126.3689	116.6447	110.1484	108.6205	112.4706	120.6670	131.0134	140.7376	(68)
Pumps, fans	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	(69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Water heating gains (Table 5)	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	(71)
Total internal gains	98.2757	96.5264	93.2590	86.2364	81.9034	77.3872	74.6750	77.0100	79.7355	84.7459	91.4852	97.3887	(72)
	374.4147	382.5026	367.0758	354.4419	337.1774	322.5221	310.7284	311.5356	320.6963	334.3180	353.9888	367.0313	(73)

6. Solar gains

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

Northwest														
7.9600				11.2829		0.6300		0.7000		0.7700		27.4478 (81)		

Solar gains	27.4478	55.8707	100.6613	165.3148	222.2155	236.9053	221.6200	176.6781	122.6574	68.2785	34.5364	22.4152	(83)	
Total gains	401.8625	438.3733	467.7371	519.7567	559.3930	559.4274	532.3485	488.2137	443.3537	402.5965	388.5252	389.4466	(84)	

7. Mean internal temperature (heating season)														

Temperature during heating periods in the living area from Table 9, Th1 (C)														
Utilisation factor for gains for living area, nil,m (see Table 9a)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	78.4549	78.6669	78.8758	79.8720	80.0612	80.9539	80.9539	81.1214	80.6077	80.0612	79.6794	79.2841		
alpha	6.2303	6.2445	6.2584	6.3248	6.3374	6.3969	6.3969	6.4081	6.3738	6.3374	6.3120	6.2856		
util living area	0.9938	0.9881	0.9725	0.9059	0.7480	0.5359	0.3902	0.4431	0.7075	0.9366	0.9860	0.9948	(86)	
MIT	20.1513	20.2841	20.4913	20.7766	20.9464	20.9943	20.9994	20.9986	20.9714	20.7537	20.4169	20.1329	(87)	
Th 2	20.1037	20.1059	20.1080	20.1182	20.1201	20.1290	20.1290	20.1306	20.1256	20.1201	20.1163	20.1122	(88)	
util rest of house	0.9917	0.9841	0.9633	0.8776	0.6920	0.4653	0.3133	0.3602	0.6307	0.9106	0.9806	0.9931	(89)	
MIT 2	19.1270	19.2969	19.5576	19.9040	20.0796	20.1261	20.1288	20.1302	20.1085	19.8872	19.4742	19.1103	(90)	
Living area fraction	19.6596	19.8102	20.0431	20.3578	20.5304	20.5776	20.5815	20.5818	20.5572	20.3378	19.9644	19.6421	(91)	
MIT	19.6596	19.8102	20.0431	20.3578	20.5304	20.5776	20.5815	20.5818	20.5572	20.3378	19.9644	19.6421	(92)	
Temperature adjustment	19.6596	19.8102	20.0431	20.3578	20.5304	20.5776	20.5815	20.5818	20.5572	20.3378	19.9644	19.6421	(93)	
adjusted MIT	19.6596	19.8102	20.0431	20.3578	20.5304	20.5776	20.5815	20.5818	20.5572	20.3378	19.9644	19.6421	(93)	

8. Space heating requirement														

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	0.9903	0.9825	0.9625	0.8859	0.7190	0.5020	0.3533	0.4034	0.6698	0.9178	0.9795	0.9919	(94)	
Useful gains	397.9773	430.7033	450.1931	460.4735	402.2037	280.8144	188.0718	196.9357	296.9381	369.5148	380.5448	386.2764	(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	749.2719	725.3901	657.1345	549.0166	422.1191	282.5978	188.2293	197.2898	306.5826	465.4978	617.9064	745.4150	(97)	
Space heating kWh	261.3632	198.0295	153.9644	63.7510	14.8171	0.0000	0.0000	0.0000	0.0000	71.4114	170.9004	267.1991	(98a)	
Space heating requirement - total per year (kWh/year)												1201.4360		
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	261.3632	198.0295	153.9644	63.7510	14.8171	0.0000	0.0000	0.0000	0.0000	71.4114	170.9004	267.1991	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1201.4360		
Space heating per m2	(98c) / (4) =											24.0287 (99)		

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)	
Fraction of space heat from main system(s)													1.0000 (202)	
Fraction of main heating from main system 2													0.0000 (203)	
Fraction of total heating from main system 1													1.0000 (204)	
Fraction of total heating from main system 2													0.0000 (205)	
Efficiency of main space heating system 1 (in %)													92.3000 (206)	
Efficiency of main space heating system 2 (in %)													88.8000 (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	261.3632	198.0295	153.9644	63.7510	14.8171	0.0000	0.0000	0.0000	0.0000	71.4114	170.9004	267.1991	(98)	
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)	
Space heating fuel (main heating system)	283.1671	214.5499	166.8087	69.0693	16.0532	0.0000	0.0000	0.0000	0.0000	77.3688	185.1575	289.4898	(211)	
Space heating efficiency (main heating system 2)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000	(212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)	
Water heating														
Water heating requirement													175.0020 (64)	
Efficiency of water heater (217)m	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	(216)	
Fuel for water heating, kWh/month	221.7880	195.8943	207.7212	181.9642	175.8802	157.9516	155.6115	162.1588	164.3238	183.8504	196.2071	219.3008	(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	11.1260	10.0493	11.1260	10.7671	11.1260	10.7671	11.1260	11.1260	10.7671	11.1260	10.7671	11.1260	(231)	
Lighting	16.1141	12.9273	11.6396	8.5277	6.5870	5.3817	6.0089	7.8106	10.1452	13.3111	15.0348	16.5620	(232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-6.0757	-9.4236	-14.8876	-18.4580	-21.4862	-20.6606	-20.4238	-18.4833	-15.3679	-11.4971	-6.9806	-5.1585	(233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)	
Electricity generated by PVs (Appendix M) (negative quantity)	-1.2453	-2.7317	-5.6443	-8.8022	-11.9605	-12.1260	-11.9706	-9.9756	-7.1151	-3.9962	-1.6912	-0.9759	(233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)	

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(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1301.6642	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2222.6518	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												131.0000	(231)
Electricity for lighting (calculated in Appendix L)												130.0500	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-247.1375	(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												3538.2285	(238)

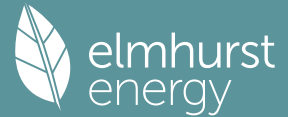
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1301.6642	0.2100	273.3495 (261)
Space heating - main system 2	0.0000	0.2100	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2222.6518	0.2100	466.7569 (264)
Space and water heating			740.1064 (265)
Pumps, fans and electric keep-hot	131.0000	0.1387	18.1713 (267)
Energy for lighting	130.0500	0.1443	18.7702 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-168.9030	0.1326	-22.4014
PV Unit electricity exported	-78.2345	0.1248	-9.7671
Total			-32.1685 (269)
Total CO2, kg/year			744.8794 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.9000 (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	1301.6642	1.1300	1470.8805 (275)
Space heating - main system 2	0.0000	1.1300	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2222.6518	1.1300	2511.5966 (278)
Space and water heating			3982.4771 (279)
Pumps, fans and electric keep-hot	131.0000	1.5128	198.1768 (281)
Energy for lighting	130.0500	1.5338	199.4751 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-168.9030	1.4901	-251.6759
PV Unit electricity exported	-78.2345	0.4582	-35.8479
Total			-287.5238 (283)
Total Primary energy kWh/year			4092.6052 (286)
Target Primary Energy Rate (TPER)			81.8500 (287)

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Plot Reference	07flr sample 4 Plot 22				Issued on Date	13/12/2025		
Assessment Reference	Block F 3B5P			Plot Type Ref	Block F 3B5P			
Plot Address					SAP Version	10.2		
SAP Rating	88 B		DER	1.38		TER	11.30	
Environmental	99 A		% DER < TER				87.79	
CO ₂ Emissions (t/year)	0.1		DFEE	26.32		TFEE	27.21	
Compliance Check	See BREL		% DFEE < TFEE				3.27	
% DPER < TPER	76.73		DPER	14.31		TPER	61.50	
Assessor Details	Mr. Andrew Jones				Assessor ID	N955-0001		
Client								

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	85.5000 (1b)	2.5000 (2b)	213.7500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	213.7500 (5)

2. Ventilation rate

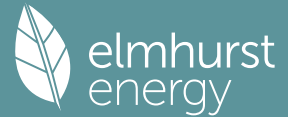
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												85.5000 (23c)
Effective ac	0.2351	0.2319	0.2287	0.2128	0.2096	0.1936	0.1936	0.1904	0.2000	0.2096	0.2159	0.2223 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows Open			21.8700	1.1450	25.0420		(27)
External Wall 1	60.0000	21.8700	38.1300	0.1500	5.7195	70.0000	2669.1000 (29a)
Total net area of external elements Aum(A, m ²)			60.0000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 30.7615		(33)
Main dwelling							
Party Wall hall			39.0000	0.0000	0.0000	180.0000	7020.0000 (32)
Party Floor 1			85.5000			40.0000	3420.0000 (32a)
Party Ceiling 1			85.5000			30.0000	2565.0000 (32b)
Internal Wall 1			208.0000			9.0000	1872.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	17546.1000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							205.2175 (35)
Thermal bridges (User defined value 0.075 * total exposed area)							4.5000 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	35.2615 (37)

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Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)m \times (5)$

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	16.5807	16.3559	16.1310	15.0069	14.7820	13.6578	13.6578	13.4330	14.1075	14.7820	15.2317	15.6814	(38)
Heat transfer coeff	51.8422	51.6174	51.3925	50.2683	50.0435	48.9193	48.9193	48.6945	49.3690	50.0435	50.4932	50.9429	(39)
Average = Sum(39)m / 12 =												50.2121	
HLP	0.6063	0.6037	0.6011	0.5879	0.5853	0.5722	0.5722	0.5695	0.5774	0.5853	0.5906	0.5958	(40)
HLP (average)												0.5873	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5590 (42)
Hot water usage for mixer showers													(42a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Hot water usage for baths													(42b)
77.4084	76.2588	74.6399	71.6549	69.4198	66.9414	65.6027	67.2103	68.9606	71.6126	74.6590	77.1467		
Hot water usage for other uses													(42c)
40.8366	39.3516	37.8666	36.3817	34.8967	33.4117	33.4117	34.8967	36.3817	37.8666	39.3516	40.8366		
Average daily hot water use (litres/day)												108.8939	(43)
Daily hot water use													
118.2450	115.6104	112.5065	108.0366	104.3165	100.3531	99.0144	102.1070	105.3423	109.4792	114.0106	117.9833	(44)	
Energy conte	187.2711	164.6276	172.9183	147.8966	140.4300	123.3959	119.7493	126.4297	129.8976	148.5623	162.4291	184.7333	(45)
Energy content (annual)												1808.3409	
Distribution loss (46)m = $0.15 \times (45)m$													
28.0907	24.6941	25.9377	22.1845	21.0645	18.5094	17.9624	18.9645	19.4846	22.2843	24.3644	27.7100	(46)	
Water storage loss (or HIU loss):													
Store volume												15.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2500	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.1500	(55)
Total storage loss													
4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	(56)
If cylinder contains dedicated solar storage													
4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
215.1835	189.8388	200.8307	174.9086	168.3424	150.4079	147.6617	154.3421	156.9096	176.4747	189.4411	212.6457	(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													
215.1835	189.8388	200.8307	174.9086	168.3424	150.4079	147.6617	154.3421	156.9096	176.4747	189.4411	212.6457	(64)	
12Total per year (kWh/year)												2136.9869	(64)
Electric shower(s)												2137	(64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
84.5976	74.9076	79.8253	70.7852	69.0229	62.6387	62.1466	64.3678	64.8005	71.7269	75.6173	83.7537	(65)	

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

Metabolic gains (Table 5), Watts													
(66)m	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
116.3400	128.8050	116.3400	120.2180	116.3400	120.2180	116.3400	116.3400	120.2180	116.3400	120.2180	116.3400	116.3400	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
230.5513	232.9437	226.9149	214.0803	197.8790	182.6521	172.4796	170.0872	176.1159	188.9505	205.1518	220.3787	(68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	(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)													
-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	(71)
Water heating gains (Table 5)													
113.7064	111.4697	107.2920	98.3128	92.7727	86.9982	83.5303	86.5159	90.0008	96.4071	105.0240	112.5722	(72)	
Total internal gains													
521.9824	534.6031	511.9317	493.9959	468.3765	451.2531	433.7347	434.3278	447.7195	463.0823	491.7785	510.6757	(73)	

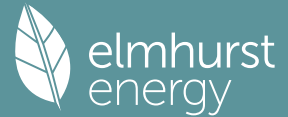
6. Solar gains

[Jan]				Area m2	Solar flux Table 6a		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
Northeast				8.9100	11.2829		0.4000	0.6000	0.7700		16.7203 (75)	
Southeast				5.0400	36.7938		0.4000	0.6000	0.7700		30.8425 (77)	
Northwest				7.9200	11.2829		0.4000	0.6000	0.7700		14.8625 (81)	
Solar gains	62.4254	116.8240	187.7085	279.2854	355.4536	371.6350	350.4921	290.8004	218.9693	136.6285	76.6816	52.1869 (83)
Total gains	584.4078	651.4271	699.6401	773.2814	823.8302	822.8881	784.2268	725.1282	666.6887	599.7108	568.4601	562.8626 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	94.0145	94.4240	94.8371	96.9580	97.3936	99.6318	99.6318	100.0918	98.7243	97.3936	96.5262	95.6742	
alpha	7.2676	7.2949	7.3225	7.4639	7.4929	7.6421	7.6421	7.6728	7.5816	7.4929	7.4351	7.3783	

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util living area	0.9806	0.9578	0.9057	0.7544	0.5615	0.3803	0.2745	0.3089	0.5094	0.8112	0.9523	0.9840 (86)
MIT	20.5167	20.6579	20.8156	20.9587	20.9953	20.9998	21.0000	21.0000	20.9983	20.9436	20.7340	20.5001 (87)
Th 2	20.4243	20.4267	20.4290	20.4409	20.4432	20.4551	20.4551	20.4575	20.4504	20.4432	20.4385	20.4338 (88)
util rest of house	0.9765	0.9497	0.8897	0.7262	0.5289	0.3480	0.2405	0.2725	0.4694	0.7800	0.9419	0.9805 (89)
MIT 2	19.9863	20.1247	20.2746	20.4100	20.4403	20.4550	20.4551	20.4575	20.4495	20.4021	20.2097	19.9784 (90)
Living area fraction	20.0998	20.2388	20.3904	20.5275	20.5591	20.5716	20.5717	20.5736	20.5669	20.5180	20.3219	20.0901 (91)
MIT	20.0998	20.2388	20.3904	20.5275	20.5591	20.5716	20.5717	20.5736	20.5669	20.5180	20.3219	20.0901 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0998	20.2388	20.3904	20.5275	20.5591	20.5716	20.5717	20.5736	20.5669	20.5180	20.3219	20.0901 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9738	0.9467	0.8885	0.7307	0.5357	0.3549	0.2477	0.2803	0.4779	0.7844	0.9395	0.9781	(94)
Useful gains	569.0691	616.7269	621.6354	565.0043	441.3562	292.0590	194.2914	203.2229	318.6385	470.4037	534.0481	550.5295	(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	819.0988	791.7492	713.8637	584.4934	443.3383	292.1279	194.2948	203.2313	319.2658	496.3309	667.6147	809.4867	(97)
Space heating kWh	186.0221	117.6150	68.6178	14.0321	1.4747	0.0000	0.0000	0.0000	0.0000	19.2898	96.1680	192.6642	(98a)
Space heating requirement - total per year (kWh/year)												695.8838	
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	186.0221	117.6150	68.6178	14.0321	1.4747	0.0000	0.0000	0.0000	0.0000	19.2898	96.1680	192.6642	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												695.8838	
Space heating per m2										(98c) / (4) =		8.1390	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (301)
Fraction of space heat from community system													1.0000 (302)
Fraction of heat from community Heat pump-Space													1.0000 (303a)
Fraction of heat from community Heat pump-Water													1.0000 (303b)
Factor for control and charging method (Table 4c(3)) for space heating													1.0500 (305)
Distribution loss factor (Table 12c) for community heating system													1.0000 (306)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating:													
Space heating requirement	186.0221	117.6150	68.6178	14.0321	1.4747	0.0000	0.0000	0.0000	0.0000	19.2898	96.1680	192.6642 (98)	
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00													
307a	195.3232	123.4957	72.0487	14.7337	1.5485	0.0000	0.0000	0.0000	0.0000	20.2543	100.9764	202.2974	
Space heating requirement	195.3232	123.4957	72.0487	14.7337	1.5485	0.0000	0.0000	0.0000	0.0000	20.2543	100.9764	202.2974 (307)	
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)	
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)	
Water heating													
Annual water heating requirement	215.1835	189.8388	200.8307	174.9086	168.3424	150.4079	147.6617	154.3421	156.9096	176.4747	189.4411	212.6457 (64)	
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00													
310b	215.1835	189.8388	200.8307	174.9086	168.3424	150.4079	147.6617	154.3421	156.9096	176.4747	189.4411	212.6457	
Water heating fuel	215.1835	189.8388	200.8307	174.9086	168.3424	150.4079	147.6617	154.3421	156.9096	176.4747	189.4411	212.6457 (310)	
Cooling System Energy Efficiency Ratio												0.0000 (314)	
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)	
Pumps and Fa	14.6731	13.2531	14.6731	14.1997	14.6731	14.1997	14.6731	14.6731	14.1997	14.6731	14.1997	14.6731 (331)	
Lighting	25.8179	20.7121	18.6489	13.6630	10.5537	8.6225	9.6274	12.5141	16.2546	21.3269	24.0887	26.5354 (332)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-12.0924	-18.6248	-29.2816	-36.1132	-41.8179	-40.1208	-39.6108	-35.9078	-29.9561	-22.5886	-13.8350	-10.2763 (333a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)	
Annual totals kWh/year													
Space heating fuel - community heating												730.6780 (307)	
Space heating fuel - secondary												0.0000 (309)	
Water heating fuel - community heating												2136.9869 (310)	
Efficiency of water heater												0.0000 (311)	
Electricity used for heat distribution (space)												7.3068 (313)	
Electricity used for heat distribution (water)												2.1265 (313)	
Space cooling fuel												0.0000 (321)	
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6625)													
mechanical ventilation fans (SFP = 0.6625)												172.7634 (330a)	
Total electricity for the above, kWh/year												172.7634 (331)	
Electricity for lighting (calculated in Appendix L)												208.3651 (332)	
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-330.2253 (333)	
Wind generation												0.0000 (334)	
Hydro-electric generation (Appendix N)												0.0000 (335a)	
Electricity generated - Micro CHP (Appendix N)												0.0000 (335)	
Appendix Q - special features													
Energy saved or generated												-0.0000 (336)	
Energy used												0.0000 (337)	
Total delivered energy for all uses												2918.5681 (338)	

12b. Carbon dioxide emissions - Community heating scheme

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	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			330.0000 (367)
Space heating from Heat pump	221.4176	0.1586	35.1237 (367)
Efficiency of heat source Heat pump			440.0000 (367)
Water heating from Heat pump	485.6788	0.0000	0.0000 (368)
Electrical energy for heat distribution (space & water)	7.3068	0.0000	4.1745 (372)
Overall CO2 factor for heat network (space)			0.0497 (386)
Overall CO2 factor for heat network (water)			0.0335 (386)
Total CO2 associated with community systems			107.8313 (373)
Space and water heating			107.8313 (376)
Pumps, fans and electric keep-hot	172.7634	0.1387	23.9644 (378)
Energy for lighting	208.3651	0.1443	30.0735 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-330.2253	0.1328	-43.8390
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-43.8390 (380)
Total CO2, kg/year			118.0302 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.3800 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			330.0000 (467a)
Space heating from Heat pump	221.4176	1.5872	351.4311 (467)
Efficiency of heat source Heat pump			440.0000 (467b)
Water heating from Heat pump	485.6788	0.0000	0.0000 (468)
Electrical energy for heat distribution (space & water)	7.3068	0.0000	44.1174 (472)
Overall CO2 factor for heat network (space)			0.4968 (486)
Overall CO2 factor for heat network (water)			0.3611 (486)
Total CO2 associated with community systems			1134.6427 (473)
Space and water heating			1134.6427 (476)
Pumps, fans and electric keep-hot	172.7634	1.5128	261.3565 (478)
Energy for lighting	208.3651	1.5338	319.5974 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-330.2253	1.4905	-492.2121
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-492.2121 (480)
Total Primary energy kWh/year			1223.3845 (483)
Dwelling Primary energy Rate (DPER)			14.3100 (484)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	85.5000	2.5000	213.7500
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.5000		
Dwelling volume			

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	30.0000 / (5) = 0.1404 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3904 (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) = 0.3318 (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	0.4230	0.4147	0.4065	0.3650	0.3567	0.3152	0.3152	0.3069	0.3318	0.3567	0.3733	0.3899 (22b)
Effective ac	0.5895	0.5860	0.5826	0.5666	0.5636	0.5497	0.5497	0.5471	0.5550	0.5636	0.5697	0.5760 (25)

3. Heat losses and heat loss parameter

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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					21.3800	1.1450	24.4809			(27)			
TER Opening Type					21.3800	1.1450	24.4809			(29a)			
External Wall 1			60.0000	21.3800	38.6200	0.1800	6.9516			(31)			
Total net area of external elements Aum(A, m2)					60.0000					(33)			
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	31.4325				(33)			
Main dwelling					39.0000	0.0000	0.0000			(32)			
Party Wall hall					39.0000	0.0000	0.0000			(32)			
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K										205.2175 (35)			
List of Thermal Bridges													
K1 Element						Length	Psi-value		Total				
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)						31.0000	0.0000		0.0000				
E7 Party floor between dwellings (in blocks of flats)						48.0000	0.0700		3.3600				
E1 Steel lintel with perforated steel base plate						9.8900	0.0500		0.4945				
E3 Sill						9.8900	0.0500		0.4945				
E4 Jamb						31.0000	0.0500		1.5500				
E16 Corner (normal)						5.0000	0.0900		0.4500				
E18 Party wall between dwellings						5.0000	0.0600		0.3000				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)										6.6490 (36)			
Point Thermal bridges								(36a) =	0.0000				
Total fabric heat loss								(33) + (36) + (36a) =	38.0815	(37)			
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	41.5806	41.3355	41.0953	39.9669	39.7557	38.7729	38.7729	38.5909	39.1515	39.7557	40.1828	40.6294	(38)
Heat transfer coeff	79.6621	79.4170	79.1768	78.0484	77.8373	76.8544	76.8544	76.6724	77.2330	77.8373	78.2644	78.7109	(39)
Average = Sum(39)m / 12 =													78.0474
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9317	0.9289	0.9260	0.9128	0.9104	0.8989	0.8989	0.8968	0.9033	0.9104	0.9154	0.9206	(40)
HLP (average)													0.9128
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)													

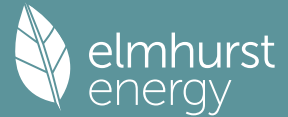
Assumed occupancy													2.5590 (42)
Hot water usage for mixer showers													(42a)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	77.4084	76.2588	74.6399	71.6549	69.4198	66.9414	65.6027	67.2103	68.9606	71.6126	74.6590	77.1467	(42b)
Hot water usage for other uses	40.8366	39.3516	37.8666	36.3817	34.8967	33.4117	33.4117	34.8967	36.3817	37.8666	39.3516	40.8366	(42c)
Average daily hot water use (litres/day)													108.8939 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	118.2450	115.6104	112.5065	108.0366	104.3165	100.3531	99.0144	102.1070	105.3423	109.4792	114.0106	117.9833	(44)
Energy conte	187.2711	164.6276	172.9183	147.8966	140.4300	123.3959	119.7493	126.4297	129.8976	148.5623	162.4291	184.7333	(45)
Energy content (annual)	Total = Sum(45)m =											1808.3409	
Distribution loss (46)m = 0.15 x (45)m													
	28.0907	24.6941	25.9377	22.1845	21.0645	18.5094	17.9624	18.9645	19.4846	22.2843	24.3644	27.7100	(46)
Water storage loss (or HIU loss):													
Store volume													15.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													0.4337 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.2342 (55)
Total storage loss	7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595	(56)
If cylinder contains dedicated solar storage	7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	217.7930	192.1958	203.4402	177.4340	170.9519	152.9332	150.2713	156.9517	159.4349	179.0842	191.9664	215.2552	(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	217.7930	192.1958	203.4402	177.4340	170.9519	152.9332	150.2713	156.9517	159.4349	179.0842	191.9664	215.2552	(64)
								Total per year (kWh/year) = Sum(64)m =				2167.7120 (64)	
													2168 (64)
12Total per year (kWh/year)													
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month	86.6852	76.7932	81.9129	72.8055	71.1105	64.6590	64.2342	66.4554	66.8208	73.8145	77.6375	85.8414	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	116.2866	128.7459	116.2866	120.1629	116.2866	120.1629	116.2866	116.2866	120.1629	116.2866	120.1629	116.2866	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	230.5513	232.9437	226.9149	214.0803	197.8790	182.6521	172.4796	170.0872	176.1159	188.9505	205.1518	220.3787	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	(71)
Water heating gains (Table 5)	116.5124	114.2757	110.0980	101.1188	95.5787	89.8042	86.3363	89.3218	92.8067	99.2130	107.8299	115.3782	(72)
Total internal gains	527.7350	540.3500	517.6843	499.7468	474.1291	454.0039	436.4873	437.0804	450.4703	468.8349	497.5294	516.4283	(73)

6. Solar gains													

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[Jan]	Area m2				Solar flux Table 6a W/m2	g Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d		Gains W	
Northeast	8.7100				11.2829	0.6300	0.7000	0.7700	0.7700		30.0339 (75)	
Southeast	4.9300				36.7938	0.6300	0.7000	0.7700	0.7700		55.4362 (77)	
Northwest	7.7400				11.2829	0.6300	0.7000	0.7700	0.7700		26.6892 (81)	
Solar gains	112.1594	209.8900	337.2261	501.7232	638.5370	667.5979	629.6201	522.4021	393.3791	245.4667	137.7722	93.7648 (83)
Total gains	639.8944	750.2400	854.9103	1001.4699	1112.6661	1121.6018	1066.1074	959.4825	843.8494	714.3016	635.3015	610.1931 (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	61.1823	61.3712	61.5574	62.4474	62.6168	63.4175	63.4175	63.5680	63.1067	62.6168	62.2750	61.9218
alpha	5.0788	5.0914	5.1038	5.1632	5.1745	5.2278	5.2278	5.2379	5.2071	5.1745	5.1517	5.1281
util living area	0.9872	0.9715	0.9321	0.8122	0.6241	0.4352	0.3167	0.3664	0.6090	0.8856	0.9730	0.9897 (86)
MIT	19.9300	20.1575	20.4614	20.7985	20.9547	20.9942	20.9991	20.9982	20.9707	20.7278	20.2779	19.8970 (87)
Th 2	20.1406	20.1430	20.1454	20.1566	20.1587	20.1685	20.1685	20.1703	20.1647	20.1587	20.1545	20.1500 (88)
util rest of house	0.9841	0.9648	0.9169	0.7784	0.5751	0.3800	0.2571	0.3009	0.5432	0.8546	0.9654	0.9871 (89)
MIT 2	18.8982	19.1859	19.5619	19.9612	20.1221	20.1650	20.1681	20.1695	20.1450	19.8950	19.3490	18.8633 (90)
Living area fraction	fLA = Living area / (4) =											0.2140 (91)
MIT	19.1191	19.3939	19.7544	20.1404	20.3003	20.3425	20.3460	20.3469	20.3217	20.0732	19.5478	19.0846 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1191	19.3939	19.7544	20.1404	20.3003	20.3425	20.3460	20.3469	20.3217	20.0732	19.5478	19.0846 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9791	0.9575	0.9088	0.7777	0.5836	0.3917	0.2698	0.3149	0.5560	0.8511	0.9586	0.9828 (94)
Useful gains	626.5047	718.3371	776.9483	778.8348	649.3143	439.2901	287.6712	302.1249	469.1507	607.9134	608.9773	599.6932 (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	1180.5176	1151.0606	1049.4438	877.2943	669.4256	441.3379	287.8952	302.6166	480.5194	737.3685	974.2209	1171.5781 (97)
Space heating kWh	412.1856	290.7901	202.7367	70.8908	14.9628	0.0000	0.0000	0.0000	0.0000	96.3146	262.9754	425.4824 (98a)
Space heating requirement - total per year (kWh/year)												1776.3385
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	412.1856	290.7901	202.7367	70.8908	14.9628	0.0000	0.0000	0.0000	0.0000	96.3146	262.9754	425.4824 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1776.3385
Space heating per m2	(98c) / (4) =											20.7759 (99)
9a. Energy requirements - Individual heating systems, including micro-CHP												
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Fraction of main heating from main system 2												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												88.8000 (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	412.1856	290.7901	202.7367	70.8908	14.9628	0.0000	0.0000	0.0000	0.0000	96.3146	262.9754	425.4824 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	446.5716	315.0489	219.6497	76.8048	16.2111	0.0000	0.0000	0.0000	0.0000	104.3495	284.9137	460.9777 (211)
Space heating efficiency (main heating system 2)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Water heating												
Water heating requirement	217.7930	192.1958	203.4402	177.4340	170.9519	152.9332	150.2713	156.9517	159.4349	179.0842	191.9664	215.2552 (64)
Efficiency of water heater (217)m	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000 (216)
Fuel for water heating, kWh/month	272.9236	240.8469	254.9376	222.3484	214.2255	191.6456	188.3099	196.6813	199.7931	224.4163	240.5594	269.7434 (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	11.1260	10.0493	11.1260	10.7671	11.1260	10.7671	11.1260	11.1260	10.7671	11.1260	10.7671	11.1260 (231)
Lighting	24.1621	19.3837	17.4529	12.7867	9.8768	8.0695	9.0100	11.7115	15.2121	19.9591	22.5438	24.8336 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-10.2542	-15.8292	-24.8861	-30.6903	-35.5620	-34.1162	-33.7044	-30.5685	-25.5264	-19.2274	-11.7499	-8.7129 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-2.2647	-4.9562	-10.2235	-15.9245	-21.6319	-21.9490	-21.6901	-18.0962	-12.9194	-7.2663	-3.0788	-1.7769 (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 (234b)

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(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1924.5271	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2716.4310	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												131.0000	(231)
Electricity for lighting (calculated in Appendix L)												195.0017	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-422.6052	(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												4544.3546	(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	1924.5271	0.2100	404.1507 (261)
Space heating - main system 2	0.0000	0.2100	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2716.4310	0.2100	570.4505 (264)
Space and water heating			974.6012 (265)
Pumps, fans and electric keep-hot	131.0000	0.1387	18.1713 (267)
Energy for lighting	195.0017	0.1443	28.1448 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-280.8275	0.1327	-37.2770
PV Unit electricity exported	-141.7776	0.1248	-17.7009
Total			-54.9779 (269)
Total CO2, kg/year			965.9394 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.3000 (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	1924.5271	1.1300	2174.7156 (275)
Space heating - main system 2	0.0000	1.1300	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2716.4310	1.1300	3069.5671 (278)
Space and water heating			5244.2826 (279)
Pumps, fans and electric keep-hot	131.0000	1.5128	198.1768 (281)
Energy for lighting	195.0017	1.5338	299.1001 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-280.8275	1.4905	-418.5670
PV Unit electricity exported	-141.7776	0.4582	-64.9673
Total			-483.5343 (283)
Total Primary energy kWh/year			5258.0253 (286)
Target Primary Energy Rate (TPER)			61.5000 (287)

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Plot Reference	08flr sample 1 Plot 23			Issued on Date	13/12/2025
Assessment Reference	Block F 3B5P	Plot Type Ref	Block F 3B5P		
Plot Address				SAP Version	10.2
SAP Rating	86 B	DER	1.88	TER	14.33
Environmental	98 A	% DER < TER			86.88
CO ₂ Emissions (t/year)	0.13	DFEE	36.24	TFEE	40.63
Compliance Check	See BREL	% DFEE < TFEE			10.79
% DPER < TPER	75.15	DPER	19.34	TPER	77.83
Assessor Details	Mr. Andrew Jones			Assessor ID	N955-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	85.5000 (1b)	2.5000 (2b)	213.7500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.5000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	213.7500 (5)

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	2	(19)

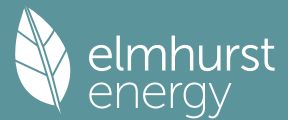
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												85.5000 (23c)
Effective ac	0.2351	0.2319	0.2287	0.2128	0.2096	0.1936	0.1936	0.1904	0.2000	0.2096	0.2159	0.2223 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows Open			21.8700	1.1450	25.0420		(27)
External Wall 1	60.0000	21.8700	38.1300	0.1500	5.7195	70.0000	2669.1000 (29a)
External Roof 1	85.5000		85.5000	0.1100	9.4050	9.0000	769.5000 (30)
Total net area of external elements A _{um} (A, m ²)			145.5000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.1665		(33)
Main dwelling							
Party Wall hall			39.0000	0.0000	0.0000	180.0000	7020.0000 (32)
Party Floor 1			85.5000			40.0000	3420.0000 (32d)
Internal Wall 1			208.0000			9.0000	1872.0000 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15750.6000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							184.2175 (35)
Thermal bridges (User defined value 0.075 * total exposed area)							10.9125 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss					(33) + (36) + (36a) =		51.0790 (37)

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Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)m \times (5)$

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	16.5807	16.3559	16.1310	15.0069	14.7820	13.6578	13.6578	13.4330	14.1075	14.7820	15.2317	15.6814	(38)
Heat transfer coeff	67.6597	67.4349	67.2100	66.0858	65.8610	64.7368	64.7368	64.5120	65.1865	65.8610	66.3107	66.7604	(39)
Average = Sum(39)m / 12 =												66.0296	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.7913	0.7887	0.7861	0.7729	0.7703	0.7572	0.7572	0.7545	0.7624	0.7703	0.7756	0.7808	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5590 (42)
Hot water usage for mixer showers													(42a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Hot water usage for baths													(42b)
77.4084	76.2588	74.6399	71.6549	69.4198	66.9414	65.6027	67.2103	68.9606	71.6126	74.6590	77.1467	77.1467	
Hot water usage for other uses													(42c)
40.8366	39.3516	37.8666	36.3817	34.8967	33.4117	33.4117	34.8967	36.3817	37.8666	39.3516	40.8366	40.8366	
Average daily hot water use (litres/day)												108.8939	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
118.2450	115.6104	112.5065	108.0366	104.3165	100.3531	99.0144	102.1070	105.3423	109.4792	114.0106	117.9833	117.9833	(44)
Energy conte	187.2711	164.6276	172.9183	147.8966	140.4300	123.3959	119.7493	126.4297	129.8976	148.5623	162.4291	184.7333	(45)
Energy content (annual)												1808.3409	
Distribution loss (46)m = $0.15 \times (45)m$													
28.0907	24.6941	25.9377	22.1845	21.0645	18.5094	17.9624	18.9645	19.4846	22.2843	24.3644	27.7100	27.7100	(46)
Water storage loss (or HIU loss):													
Store volume												15.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2500	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.1500	(55)
Total storage loss													
4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.5000	4.6500	4.5000	4.6500	(56)
If cylinder contains dedicated solar storage													
4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
215.1835	189.8388	200.8307	174.9086	168.3424	150.4079	147.6617	154.3421	156.9096	176.4747	189.4411	212.6457	212.6457	(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	215.1835	189.8388	200.8307	174.9086	168.3424	150.4079	147.6617	154.3421	156.9096	176.4747	189.4411	212.6457	(64)
12Total per year (kWh/year)												2136.9869	(64)
Electric shower(s)												2137	(64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
84.5976	74.9076	79.8253	70.7852	69.0229	62.6387	62.1466	64.3678	64.8005	71.7269	75.6173	83.7537	83.7537	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	127.9493	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
116.3400	128.8050	116.3400	120.2180	116.3400	120.2180	116.3400	116.3400	120.2180	116.3400	120.2180	116.3400	116.3400	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
230.5513	232.9437	226.9149	214.0803	197.8790	182.6521	172.4796	170.0872	176.1159	188.9505	205.1518	220.3787	220.3787	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	(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)													
-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	(71)
Water heating gains (Table 5)													
113.7064	111.4697	107.2920	98.3128	92.7727	86.9982	83.5303	86.5159	90.0008	96.4071	105.0240	112.5722	112.5722	(72)
Total internal gains													
521.9824	534.6031	511.9317	493.9959	468.3765	451.2531	433.7347	434.3278	447.7195	463.0823	491.7785	510.6757	510.6757	(73)

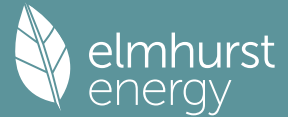
6. Solar gains

[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					8.9100	11.2829		0.4000	0.6000	0.7700		16.7203 (75)				
Southeast					5.0400	36.7938		0.4000	0.6000	0.7700		30.8425 (77)				
Northwest					7.9200	11.2829		0.4000	0.6000	0.7700		14.8625 (81)				
Solar gains					62.4254	116.8240	187.7085	279.2854	355.4536	371.6350	350.4921	290.8004	218.9693	136.6285	76.6816	52.1869 (83)
Total gains					584.4078	651.4271	699.6401	773.2814	823.8302	822.8881	784.2268	725.1282	666.6887	599.7108	568.4601	562.8626 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
64.6643	64.8799	65.0969	66.2043	66.4303	67.5839	67.5839	67.8195	67.1177	66.4303	65.9798	65.5354	65.5354	
alpha	5.3110	5.3253	5.3398	5.4136	5.4287	5.5056	5.5056	5.5213	5.4745	5.4287	5.3987	5.3690	

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util living area	0.9852	0.9726	0.9452	0.8579	0.6987	0.4977	0.3623	0.4075	0.6470	0.8947	0.9705	0.9876 (86)
MIT	20.0439	20.2194	20.4589	20.7638	20.9359	20.9917	20.9988	20.9978	20.9680	20.7426	20.3590	20.0213 (87)
Th 2	20.2608	20.2631	20.2654	20.2769	20.2791	20.2906	20.2906	20.2929	20.2860	20.2791	20.2746	20.2700 (88)
util rest of house												
MIT 2	0.9820	0.9669	0.9339	0.8320	0.6553	0.4447	0.3044	0.3457	0.5890	0.8690	0.9633	0.9849 (89)
Living area fraction	19.3878	19.5619	19.7959	20.0888	20.2355	20.2864	20.2902	20.2921	20.2677	20.0774	19.7098	19.3730 (90)
MIT	19.5282	19.7026	19.9378	20.2333	20.3854	20.4373	20.4419	20.4431	20.4176	20.2198	19.8488	19.5118 (91)
Temperature adjustment												0.0000 (92)
adjusted MIT	19.5282	19.7026	19.9378	20.2333	20.3854	20.4373	20.4419	20.4431	20.4176	20.2198	19.8488	19.5118 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9781	0.9616	0.9281	0.8303	0.6620	0.4558	0.3168	0.3589	0.6000	0.8667	0.9583	0.9813	(94)
Useful gains	571.6020	626.4327	649.3482	642.0469	545.3391	375.0560	248.4052	260.2400	400.0330	519.7496	544.7336	552.3553	(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	1030.3372	998.2111	903.1552	748.9683	572.0320	377.8899	248.7102	260.8309	411.8192	633.5683	845.3804	1022.2196	(97)
Space heating kWh	341.2990	249.8351	188.8324	76.9834	19.8595	0.0000	0.0000	0.0000	0.0000	84.6811	216.4657	349.5790	(98a)
Space heating requirement - total per year (kWh/year)												1527.5353	
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	341.2990	249.8351	188.8324	76.9834	19.8595	0.0000	0.0000	0.0000	0.0000	84.6811	216.4657	349.5790	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1527.5353	
Space heating per m2										(98c) / (4) =		17.8659	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space												1.0000	(303a)
Fraction of heat from community Heat pump-Water												1.0000	(303b)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500	(305)
Distribution loss factor (Table 12c) for community heating system												1.0000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	341.2990	249.8351	188.8324	76.9834	19.8595	0.0000	0.0000	0.0000	0.0000	84.6811	216.4657	349.5790	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00													
307a	358.3639	262.3269	198.2740	80.8326	20.8525	0.0000	0.0000	0.0000	0.0000	88.9152	227.2890	367.0579	
Space heating requirement	358.3639	262.3269	198.2740	80.8326	20.8525	0.0000	0.0000	0.0000	0.0000	88.9152	227.2890	367.0579	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating													
Annual water heating requirement	215.1835	189.8388	200.8307	174.9086	168.3424	150.4079	147.6617	154.3421	156.9096	176.4747	189.4411	212.6457	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00													
310b	215.1835	189.8388	200.8307	174.9086	168.3424	150.4079	147.6617	154.3421	156.9096	176.4747	189.4411	212.6457	
Water heating fuel	215.1835	189.8388	200.8307	174.9086	168.3424	150.4079	147.6617	154.3421	156.9096	176.4747	189.4411	212.6457	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	14.6731	13.2531	14.6731	14.1997	14.6731	14.1997	14.6731	14.6731	14.6731	14.6731	14.1997	14.6731	(331)
Lighting	25.8179	20.7121	18.6489	13.6630	10.5537	8.6225	9.6274	12.5141	16.2546	21.3269	24.0887	26.5354	(332)
Electricity generated by PVs (Appendix M) (negative quantity)	-12.0924	-18.6248	-29.2816	-36.1132	-41.8179	-40.1208	-39.6108	-35.9078	-29.9561	-22.5886	-13.8350	-10.2763	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1603.9120	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												2136.9869	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution (space)												16.0391	(313)
Electricity used for heat distribution (water)												2.1265	(313)
Space cooling fuel												0.0000	(321)

Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6625)													
mechanical ventilation fans (SFP = 0.6625)													172.7634 (330a)
Total electricity for the above, kWh/year													172.7634 (331)
Electricity for lighting (calculated in Appendix L)													208.3651 (332)

Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-330.2253	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3791.8022	(338)

12b. Carbon dioxide emissions - Community heating scheme

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	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			330.0000 (367)
Space heating from Heat pump	486.0340	0.1567	76.1444 (367)
Efficiency of heat source Heat pump			440.0000 (367)
Water heating from Heat pump	485.6788	0.0000	0.0000 (368)
Electrical energy for heat distribution (space & water)	16.0391	0.0000	5.5282 (372)
Overall CO2 factor for heat network (space)			0.0490 (386)
Overall CO2 factor for heat network (water)			0.0335 (386)
Total CO2 associated with community systems			150.2057 (373)
Space and water heating			150.2057 (376)
Pumps, fans and electric keep-hot	172.7634	0.1387	23.9644 (378)
Energy for lighting	208.3651	0.1443	30.0735 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-330.2253	0.1328	-43.8390
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-43.8390 (380)
Total CO2, kg/year			160.4046 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.8800 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			330.0000 (467a)
Space heating from Heat pump	486.0340	1.5800	767.9293 (467)
Efficiency of heat source Heat pump			440.0000 (467b)
Water heating from Heat pump	485.6788	0.0000	0.0000 (468)
Electrical energy for heat distribution (space & water)	16.0391	0.0000	57.8618 (472)
Overall CO2 factor for heat network (space)			0.4946 (486)
Overall CO2 factor for heat network (water)			0.3611 (486)
Total CO2 associated with community systems			1564.8852 (473)
Space and water heating			1564.8852 (476)
Pumps, fans and electric keep-hot	172.7634	1.5128	261.3565 (478)
Energy for lighting	208.3651	1.5338	319.5974 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-330.2253	1.4905	-492.2121
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-492.2121 (480)
Total Primary energy kWh/year			1653.6271 (483)
Dwelling Primary energy Rate (DPER)			19.3400 (484)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	85.5000	2.5000	213.7500
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.5000		
Dwelling volume			

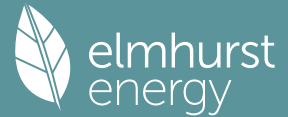
2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	30.0000 / (5) = 0.1404 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3904 (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) = 0.3318 (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	0.4230	0.4147	0.4065	0.3650	0.3567	0.3152	0.3152	0.3069	0.3318	0.3567	0.3733	0.3899 (22b)
Effective ac	0.5895	0.5860	0.5826	0.5666	0.5636	0.5497	0.5497	0.5471	0.5550	0.5636	0.5697	0.5760 (25)

3. Heat losses and heat loss parameter

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Element													
Main dwelling													
TER Opening Type													(27)
External Wall 1	60.0000		21.3800			21.3800	1.1450		24.4809				(29a)
External Roof 1	85.5000					38.6200	0.1800		6.9516				(30)
Total net area of external elements Aum(A, m2)						85.5000	0.1100		9.4050				(31)
Fabric heat loss, W/K = Sum (A x U)						145.5000							(32)
Main dwelling													(33)
Party Wall hall						39.0000	0.0000		0.0000				(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												184.2175	(35)
List of Thermal Bridges													
K1 Element													
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)													
E7 Party floor between dwellings (in blocks of flats)													
E15 Flat roof with parapet													
P4 Party wall - Roof (insulation at ceiling level)													
E1 Steel lintel with perforated steel base plate													
E3 Sill													
E4 Jamb													
E16 Corner (normal)													
E18 Party wall between dwellings													
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												20.2690	(36)
Point Thermal bridges												0.0000	
Total fabric heat loss												61.1065	(37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(38)
	41.5806	41.3355	41.0953	39.9669	39.7557	38.7729	38.7729	38.5909	39.1515	39.7557	40.1828	40.6294	
Heat transfer coeff	102.6871	102.4420	102.2018	101.0734	100.8623	99.8794	99.8794	99.6974	100.2580	100.8623	101.2894	101.7359	(39)
Average = Sum(39)m / 12 =												101.0724	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(40)
HLP (average)	1.2010	1.1982	1.1953	1.1821	1.1797	1.1682	1.1682	1.1661	1.1726	1.1797	1.1847	1.1899	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

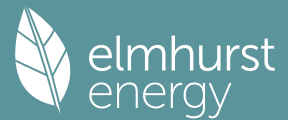
4. Water heating energy requirements (kWh/year)													

Assumed occupancy													2.5590 (42)
Hot water usage for mixer showers													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
77.4084	76.2588	74.6399	71.6549	69.4198	66.9414	65.6027	67.2103	68.9606	71.6126	74.6590	77.1467		(42b)
Hot water usage for other uses													
40.8366	39.3516	37.8666	36.3817	34.8967	33.4117	33.4117	34.8967	36.3817	37.8666	39.3516	40.8366		(42c)
Average daily hot water use (litres/day)												108.8939	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	118.2450	115.6104	112.5065	108.0366	104.3165	100.3531	99.0144	102.1070	105.3423	109.4792	114.0106	117.9833	(44)
Energy conte	187.2711	164.6276	172.9183	147.8966	140.4300	123.3959	119.7493	126.4297	129.8976	148.5623	162.4291	184.7333	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
28.0907	24.6941	25.9377	22.1845	21.0645	18.5094	17.9624	18.9645	19.4846	22.2843	24.3644	27.7100		(46)
Water storage loss (or HIU loss):													
Store volume												15.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.4337	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.2342	(55)
Total storage loss													
7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595	(56)
If cylinder contains dedicated solar storage													
7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
217.7930	192.1958	203.4402	177.4340	170.9519	152.9332	150.2713	156.9517	159.4349	179.0842	191.9664	215.2552		(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	217.7930	192.1958	203.4402	177.4340	170.9519	152.9332	150.2713	156.9517	159.4349	179.0842	191.9664	215.2552	(64)
12Total per year (kWh/year)												2167.7120	(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	86.6852	76.7932	81.9129	72.8055	71.1105	64.6590	64.2342	66.4554	66.8208	73.8145	77.6375	85.8414	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
116.2866	128.7459	116.2866	120.1629	116.2866	120.1629	116.2866	116.2866	120.1629	116.2866	120.1629	116.2866		(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
230.5513	232.9437	226.9149	214.0803	197.8790	182.6521	172.4796	170.0872	176.1159	188.9505	205.1518	220.3787		(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	35.7949	(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)													
-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	-102.3594	(71)
Water heating gains (Table 5)													
116.5124	114.2757	110.0980	101.1188	95.5787	89.8042	86.3363	89.3218	92.8067	99.2130	107.8299	115.3782		(72)
Total internal gains	527.7350	540.3500	517.6843	499.7468	474.1291	454.0039	436.4873	437.0804	450.4703	468.8349	497.5294	516.4283	(73)

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6. Solar gains

[Jan]	Area m2				Solar flux Table 6a W/m2	Specific data or Table 6b	g or Table 6b	Specific data or Table 6c	FF or Table 6c	Access factor Table 6d	Gains W	
Northeast	8.7100				11.2829		0.6300		0.7000	0.7700	30.0339	(75)
Southeast	4.9300				36.7938		0.6300		0.7000	0.7700	55.4362	(77)
Northwest	7.7400				11.2829		0.6300		0.7000	0.7700	26.6892	(81)
Solar gains	112.1594	209.8900	337.2261	501.7232	638.5370	667.5979	629.6201	522.4021	393.3791	245.4667	137.7722	93.7648 (83)
Total gains	639.8944	750.2400	854.9103	1001.4699	1112.6661	1121.6018	1066.1074	959.4825	843.8494	714.3016	635.3015	610.1931 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	42.6068	42.7087	42.8091	43.2870	43.3776	43.8045	43.8045	43.8844	43.6391	43.3776	43.1947	43.0052
util living area	3.8405	3.8472	3.8539	3.8858	3.8918	3.9203	3.9203	3.9256	3.9093	3.8918	3.8796	3.8670
util living area	0.9857	0.9731	0.9454	0.8663	0.7228	0.5411	0.4046	0.4638	0.7107	0.9156	0.9744	0.9879 (86)
MIT	19.3036	19.5607	19.9446	20.4415	20.7896	20.9490	20.9872	20.9786	20.8551	20.3790	19.7611	19.2645 (87)
Th 2	19.9192	19.9215	19.9237	19.9343	19.9363	19.9455	19.9455	19.9473	19.9420	19.9363	19.9323	19.9281 (88)
util rest of house	0.9822	0.9667	0.9323	0.8358	0.6668	0.4621	0.3111	0.3639	0.6330	0.8889	0.9672	0.9850 (89)
MIT 2	17.9607	18.2869	18.7679	19.3732	19.7572	19.9139	19.9406	19.9382	19.8378	19.3174	18.5512	17.9170 (90)
Living area fraction	18.2482	18.5595	19.0198	19.6018	19.9782	20.1354	20.1646	20.1609	20.0555	19.5446	18.8101	18.2055 (92)
MIT	18.2482	18.5595	19.0198	19.6018	19.9782	20.1354	20.1646	20.1609	20.0555	19.5446	18.8101	18.2055 (93)
Temperature adjustment												0.0000
adjusted MIT	18.2482	18.5595	19.0198	19.6018	19.9782	20.1354	20.1646	20.1609	20.0555	19.5446	18.8101	18.2055 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9744	0.9557	0.9183	0.8248	0.6692	0.4768	0.3309	0.3848	0.6421	0.8767	0.9567	0.9781 (94)
Ext temp.	623.5250	716.9914	785.0805	825.9829	744.6142	534.8077	352.7988	369.1819	541.8075	626.2571	607.8193	596.8426 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Space heating kWh	1432.2970	1399.3069	1279.5442	1081.6705	834.9565	552.8760	356.0324	374.9510	597.0861	902.1747	1186.1119	1424.8574 (97)
Space heating requirement - total per year (kWh/year)	601.7263	458.5160	367.8810	184.0951	67.2147	0.0000	0.0000	0.0000	0.0000	205.2827	416.3706	616.0430 (98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Space heating kWh	601.7263	458.5160	367.8810	184.0951	67.2147	0.0000	0.0000	0.0000	0.0000	205.2827	416.3706	616.0430 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2917.1294
Space heating per m2										(98c) / (4) =		34.1185 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Fraction of main heating from main system 2												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												88.8000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating efficiency (main heating system 1)	601.7263	458.5160	367.8810	184.0951	67.2147	0.0000	0.0000	0.0000	0.0000	205.2827	416.3706	616.0430 (98)
Space heating fuel (main heating system)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating efficiency (main heating system 2)	651.9245	496.7671	398.5709	199.4529	72.8220	0.0000	0.0000	0.0000	0.0000	222.4081	451.1058	667.4355 (211)
Space heating fuel (main heating system 2)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (212)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	217.7930	192.1958	203.4402	177.4340	170.9519	152.9332	150.2713	156.9517	159.4349	179.0842	191.9664	215.2552 (64)
Efficiency of water heater	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000 (216)
Fuel for water heating, kWh/month	272.9236	240.8469	254.9376	222.3484	214.2255	191.6456	188.3099	196.6813	199.7931	224.4163	240.5594	269.7434 (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	11.1260	10.0493	11.1260	10.7671	11.1260	10.7671	11.1260	11.1260	10.7671	11.1260	10.7671	11.1260 (231)
Lighting	24.1621	19.8337	17.4529	12.7867	9.8768	8.0695	9.0100	11.7115	15.2121	19.9591	22.5438	24.8336 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-10.2542	-15.8292	-24.8861	-30.6903	-35.5620	-34.1162	-33.7044	-30.5685	-25.5264	-19.2274	-11.7499	-8.7129 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-2.2647	-4.9562	-10.2235	-15.9245	-21.6319	-21.9490	-21.6901	-18.0962	-12.9194	-7.2663	-3.0788	-1.7769 (233b)

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Electricity generated by wind turbines (Appendix M) (negative quantity)														
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)														
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year														
Space heating fuel - main system 1													3160.4869	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													79.8000	
Water heating fuel used													2716.4310	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:														
Total electricity for the above, kWh/year													131.0000	(231)
Electricity for lighting (calculated in Appendix L)													195.0017	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-422.6052	(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													5780.3145	(238)

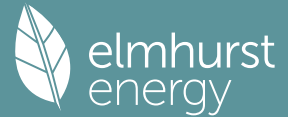
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3160.4869	0.2100	663.7023 (261)
Space heating - main system 2	0.0000	0.2100	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2716.4310	0.2100	570.4505 (264)
Space and water heating			1234.1528 (265)
Pumps, fans and electric keep-hot	131.0000	0.1387	18.1713 (267)
Energy for lighting	195.0017	0.1443	28.1448 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-280.8275	0.1327	-37.2770
PV Unit electricity exported	-141.7776	0.1248	-17.7009
Total			-54.9779 (269)
Total CO2, kg/year			1225.4910 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.3300 (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	3160.4869	1.1300	3571.3502 (275)
Space heating - main system 2	0.0000	1.1300	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2716.4310	1.1300	3069.5671 (278)
Space and water heating			6640.9173 (279)
Pumps, fans and electric keep-hot	131.0000	1.5128	198.1768 (281)
Energy for lighting	195.0017	1.5338	299.1001 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-280.8275	1.4905	-418.5670
PV Unit electricity exported	-141.7776	0.4582	-64.9673
Total			-483.5343 (283)
Total Primary energy kWh/year			6654.6600 (286)
Target Primary Energy Rate (TPER)			77.8300 (287)

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Plot Reference	08fir sample 2 Plot 24				Issued on Date	13/12/2025	
Assessment Reference	Block F 1B2P			Plot Type Ref	Block F 1B2P		
Plot Address					SAP Version	10.2	
SAP Rating	87 B		DER	1.33		TER	13.80
Environmental	99 A		% DER < TER				90.36
CO ₂ Emissions (t/year)	0.06		DFEE	23.54		TFEE	26.06
Compliance Check	See BREL		% DFEE < TFEE				9.68
% DPER < TPER	81.81		DPER	13.81		TPER	75.91
Assessor Details	Mr. Andrew Jones				Assessor ID	N955-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	50.0000 (1b)	2.5000 (2b)	125.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	125.0000 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1162 (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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												86.4000 (23c)
Effective ac	0.2162	0.2133	0.2104	0.1959	0.1930	0.1784	0.1784	0.1755	0.1842	0.1930	0.1988	0.2046 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows Open			8.3600	1.1450	9.5725		(27)
External Wall 1	17.5000	8.3600	9.1400	0.1500	1.3710	70.0000	639.8000 (29a)
External Roof 1	50.0000		50.0000	0.1100	5.5000	9.0000	450.0000 (30)
Total net area of external elements A _{um} (A, m ²)			67.5000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.4435		(33)
Main dwelling							
Party Wall hall			55.0000	0.0000	0.0000	180.0000	9900.0000 (32)
Party Floor 1			50.0000			40.0000	2000.0000 (32d)
Internal Wall 1			84.4500			9.0000	760.0500 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		13749.8500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							274.9970 (35)
Thermal bridges (User defined value 0.075 * total exposed area)							5.0625 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss					(33) + (36) + (36a) =		21.5060 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	8.9190	8.7991	8.6793	8.0798	7.9600	7.3605	7.3605	7.2407	7.6003	7.9600	8.1997	8.4395	(38)
Heat transfer coeff	30.4250	30.3052	30.1853	29.5859	29.4660	28.8666	28.8666	28.7467	29.1063	29.4660	29.7057	29.9455	(39)
Average = Sum(39)m / 12 =												29.5559	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6085	0.6061	0.6037	0.5917	0.5893	0.5773	0.5773	0.5749	0.5821	0.5893	0.5941	0.5989	(40)
HLP (average)												0.5911	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6901 (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	60.5412	59.6421	58.3759	56.0413	54.2933	52.3549	51.3079	52.5652	53.9342	56.0083	58.3909	60.3365	(42b)
Hot water usage for other uses	31.9383	30.7769	29.6155	28.4541	27.2927	26.1314	26.1314	27.2927	28.4541	29.6155	30.7769	31.9383	(42c)
Average daily hot water use (litres/day)												85.1660	(43)
Daily hot water use	92.4795	90.4190	87.9914	84.4955	81.5860	78.4863	77.4393	79.8580	82.3883	85.6238	89.1678	92.2748	(44)
Energy conte	146.4649	128.7554	135.2396	115.6701	109.8304	96.5080	93.6561	98.8808	101.5930	116.1907	127.0359	144.4801	(45)
Energy content (annual)										Total = Sum(45)m =		1414.3051	
Distribution loss (46)m = 0.15 x (45)m	21.9697	19.3133	20.2859	17.3505	16.4746	14.4762	14.0484	14.8321	15.2390	17.4286	19.0554	21.6720	(46)
Water storage loss (or HIU loss):													
Store volume												15.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2500	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.1500	(55)
Total storage loss	4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500	(56)
If cylinder contains dedicated solar storage	4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	174.3773	153.9666	163.1520	142.6821	137.7428	123.5200	121.5685	126.7932	128.6050	144.1031	154.0479	172.3925	(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	174.3773	153.9666	163.1520	142.6821	137.7428	123.5200	121.5685	126.7932	128.6050	144.1031	154.0479	172.3925	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1742.9511	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000	(64a)
Heat gains from water heating, kWh/month	71.0295	62.9801	67.2971	60.0699	58.8485	53.6985	53.4706	55.2078	55.3893	60.9633	63.8490	70.3695	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	79.2676	87.7605	79.2676	81.9098	79.2676	81.9098	79.2676	79.2676	81.9098	79.2676	81.9098	79.2676	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.2339	148.7618	144.9117	136.7153	126.3689	116.6447	110.1484	108.6205	112.4706	120.6670	131.0134	140.7376	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	(71)
Water heating gains (Table 5)	95.4698	93.7204	90.4531	83.4304	79.0975	74.5813	71.8690	74.2040	76.9296	81.9400	88.6792	94.5827	(72)
Total internal gains	370.3228	378.5942	362.9838	350.4071	333.0855	321.4873	309.6365	310.4436	319.6615	330.2260	349.9540	362.9394	(73)

6. Solar gains

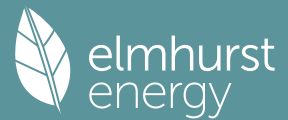
[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
-----					8.3600	36.7938	0.4000	0.6000	0.7700		51.1594 (77)	

Solar gains	51.1594	87.1435	119.2335	147.7361	165.4767	164.2801	158.3835	145.1482	129.1046	96.3121	61.2772	43.7818 (83)
Total gains	421.4822	465.7377	482.2173	498.1431	498.5622	485.7674	468.0200	455.5918	448.7661	426.5381	411.2312	406.7212 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	125.5348	126.0314	126.5320	129.0955	129.6208	132.3123	132.3123	132.8641	131.2224	129.6208	128.5745	127.5451	
alpha	9.3690	9.4021	9.4355	9.6064	9.6414	9.8208	9.8208	9.8576	9.7482	9.6414	9.5716	9.5030	
util living area	0.9654	0.9235	0.8548	0.7099	0.5489	0.3803	0.2714	0.2902	0.4474	0.7099	0.9072	0.9716	(86)

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MIT	20.7787	20.8735	20.9443	20.9905	20.9992	21.0000	21.0000	21.0000	20.9999	20.9920	20.9127	20.7636 (87)
Th 2	20.4224	20.4245	20.4267	20.4375	20.4396	20.4504	20.4504	20.4526	20.4461	20.4396	20.4353	20.4310 (88)
util rest of house	0.9571	0.9084	0.8315	0.6794	0.5161	0.3477	0.2375	0.2557	0.4116	0.6744	0.8876	0.9645 (89)
MIT 2	20.2319	20.3208	20.3842	20.4311	20.4392	20.4504	20.4504	20.4526	20.4461	20.4346	20.3670	20.2256 (90)
Living area fraction									fLA = Living area / (4) =			0.5200 (91)
MIT	20.5162	20.6082	20.6754	20.7220	20.7304	20.7362	20.7362	20.7373	20.7341	20.7244	20.6508	20.5053 (92)
Temperature adjustment												0.0000
adjusted MIT	20.5162	20.6082	20.6754	20.7220	20.7304	20.7362	20.7362	20.7373	20.7341	20.7244	20.6508	20.5053 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9586	0.9134	0.8419	0.6950	0.5331	0.3646	0.2551	0.2737	0.4302	0.6926	0.8954	0.9655	(94)
Useful gains	404.0308	425.4267	405.9928	346.1924	265.7964	177.1254	119.3981	124.6814	193.0637	295.4057	368.2332	392.7009	(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	493.3796	476.0399	427.8894	349.7633	266.0882	177.1310	119.3983	124.6816	193.0933	298.3262	402.5359	488.2716	(97)
Space heating kWh	66.4755	34.0121	16.2911	2.5710	0.2171	0.0000	0.0000	0.0000	0.0000	2.1729	24.6979	71.1046	(98a)
Space heating requirement - total per year (kWh/year)												217.5421	
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	66.4755	34.0121	16.2911	2.5710	0.2171	0.0000	0.0000	0.0000	0.0000	2.1729	24.6979	71.1046	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												217.5421	
Space heating per m2										(98c) / (4) =		4.3508	(99)

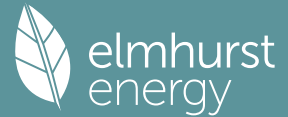
9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)
Fraction of space heat from community system												1.0000 (302)
Fraction of heat from community Heat pump-Space												1.0000 (303a)
Fraction of heat from community Heat pump-Water												1.0000 (303b)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500 (305)
Distribution loss factor (Table 12c) for community heating system												1.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	66.4755	34.0121	16.2911	2.5710	0.2171	0.0000	0.0000	0.0000	0.0000	2.1729	24.6979	71.1046 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00												
307a	69.7992	35.7127	17.1056	2.6996	0.2280	0.0000	0.0000	0.0000	0.0000	2.2815	25.9328	74.6599
Space heating requirement	69.7992	35.7127	17.1056	2.6996	0.2280	0.0000	0.0000	0.0000	0.0000	2.2815	25.9328	74.6599 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement	174.3773	153.9666	163.1520	142.6821	137.7428	123.5200	121.5685	126.7932	128.6050	144.1031	154.0479	172.3925 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00												
310b	174.3773	153.9666	163.1520	142.6821	137.7428	123.5200	121.5685	126.7932	128.6050	144.1031	154.0479	172.3925
Water heating fuel	174.3773	153.9666	163.1520	142.6821	137.7428	123.5200	121.5685	126.7932	128.6050	144.1031	154.0479	172.3925 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	9.7140	8.7740	9.7140	9.4007	9.7140	9.4007	9.7140	9.7140	9.4007	9.7140	9.4007	9.7140 (331)
Lighting	17.5909	14.1120	12.7063	9.3092	7.1907	5.8749	6.5596	8.5264	11.0750	14.5310	16.4127	18.0798 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-11.4799	-17.3436	-26.7500	-32.3479	-36.9001	-35.2195	-34.7956	-31.8263	-26.9460	-20.7936	-13.0268	-9.7932 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												228.4192 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												1742.9511 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution (space)												2.2842 (313)
Electricity used for heat distribution (water)												1.7239 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)												
mechanical ventilation fans (SFP = 0.7500)												114.3750 (330a)
Total electricity for the above, kWh/year												114.3750 (331)
Electricity for lighting (calculated in Appendix L)												141.9684 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-297.2225 (333)
Wind generation												0.0000 (334)
Hydro-electric generation (Appendix N)												0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (335)
Appendix Q - special features												
Energy saved or generated												-0.0000 (336)
Energy used												0.0000 (337)
Total delivered energy for all uses												1930.4912 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
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Efficiency of heat source Heat pump			330.0000 (367)
Space heating from Heat pump	69.2180	0.1599	11.0668 (367)
Efficiency of heat source Heat pump			440.0000 (367)
Water heating from Heat pump	396.1252	0.0000	0.0000 (368)
Electrical energy for heat distribution (space & water)	2.2842	0.0000	2.8229 (372)
Overall CO2 factor for heat network (space)			0.0500 (386)
Overall CO2 factor for heat network (water)			0.0335 (386)
Total CO2 associated with community systems			69.7470 (373)
Space and water heating			69.7470 (376)
Pumps, fans and electric keep-hot	114.3750	0.1387	15.8652 (378)
Energy for lighting	141.9684	0.1443	20.4904 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-297.2225	0.1331	-39.5674
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-39.5674 (380)
Total CO2, kg/year			66.5353 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.3300 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			330.0000 (467a)
Space heating from Heat pump	69.2180	1.5918	110.1784 (467)
Efficiency of heat source Heat pump			440.0000 (467b)
Water heating from Heat pump	396.1252	0.0000	0.0000 (468)
Electrical energy for heat distribution (space & water)	2.2842	0.0000	30.1533 (472)
Overall CO2 factor for heat network (space)			0.4983 (486)
Overall CO2 factor for heat network (water)			0.3610 (486)
Total CO2 associated with community systems			742.9993 (473)
Space and water heating			742.9993 (476)
Pumps, fans and electric keep-hot	114.3750	1.5128	173.0265 (478)
Energy for lighting	141.9684	1.5338	217.7558 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-297.2225	1.4919	-443.4319
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-443.4319 (480)
Total Primary energy kWh/year			690.3497 (483)
Dwelling Primary energy Rate (DPER)			13.8100 (484)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	50.0000 (1b)	2.5000 (2b)	125.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	125.0000 (5)

2. Ventilation rate

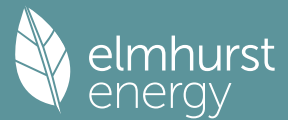
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1600 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4100 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (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	0.4051	0.3972	0.3892	0.3495	0.3416	0.3019	0.3019	0.2939	0.3178	0.3416	0.3575	0.3734 (22b)
Effective ac	0.5821	0.5789	0.5758	0.5611	0.5583	0.5456	0.5456	0.5432	0.5505	0.5583	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
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Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K
TER Opening Type			8.3600	1.1450	9.5725		(27)
External Wall 1	17.5000	8.3600	9.1400	0.1800	1.6452		(29a)
External Roof 1	50.0000		50.0000	0.1100	5.5000		(30)
Total net area of external elements Aum(A, m2)			67.5000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	16.7177			(33)
Main dwelling							
Party Wall hall		55.0000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 274.9970 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	22.0000	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.0000	0.0700	0.4900
E7 Party floor between dwellings (in blocks of flats)	7.0000	0.5600	3.9200
E15 Flat roof with parapet	22.0000	0.1200	2.6400
P4 Party wall - Roof (insulation at ceiling level)	3.8000	0.0500	0.1900
E1 Steel lintel with perforated steel base plate	3.8000	0.0500	0.1900
E3 Sill	8.8000	0.0500	0.4400
E4 Jamb	7.0000	0.0800	0.5600
E14 Flat roof	10.0000	0.0600	0.6000
E18 Party wall between dwellings			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.0300 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	25.7477 (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	24.0102	23.8788	23.7499	23.1447	23.0315	22.5044	22.5044	22.4068	22.7074	23.0315	23.2605	23.5000 (38)
Heat transfer coeff	49.7579	49.6265	49.4976	48.8924	48.7792	48.2521	48.2521	48.1545	48.4551	48.7792	49.0083	49.2477 (39)
Average = Sum(39)m / 12 =												48.8919
HLP	0.9952	0.9925	0.9900	0.9778	0.9756	0.9650	0.9650	0.9631	0.9691	0.9756	0.9802	Dec 0.9850 (40)
HLP (average)												0.9778
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

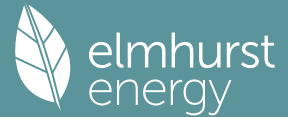
Assumed occupancy												1.6901 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	60.5412	59.6421	58.3759	56.0413	54.2933	52.3549	51.3079	52.5652	53.9342	56.0083	58.3909	60.3365 (42b)
Hot water usage for other uses	31.9383	30.7769	29.6155	28.4541	27.2927	26.1314	26.1314	27.2927	28.4541	29.6155	30.7769	31.9383 (42c)
Average daily hot water use (litres/day)												85.1660 (43)
Daily hot water use	92.4795	90.4190	87.9914	84.4955	81.5860	78.4863	77.4393	79.8580	82.3883	85.6238	89.1678	92.2748 (44)
Energy conte	146.4649	128.7554	135.2396	115.6701	109.8304	96.5080	93.6561	98.8808	101.5930	116.1907	127.0359	144.4801 (45)
Energy content (annual)												Total = Sum(45)m = 1414.3051
Distribution loss (46)m = 0.15 x (45)m	21.9697	19.3133	20.2859	17.3505	16.4746	14.4762	14.0484	14.8321	15.2390	17.4286	19.0554	21.6720 (46)
Water storage loss (or HIU loss):												
Store volume												15.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.4337 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.2342 (55)
Total storage loss	7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595 (56)
If cylinder contains dedicated solar storage	7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	176.9868	156.3236	165.7615	145.2074	140.3524	126.0454	124.1780	129.4027	131.1304	146.7126	156.5733	175.0020 (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	176.9868	156.3236	165.7615	145.2074	140.3524	126.0454	124.1780	129.4027	131.1304	146.7126	156.5733	175.0020 (64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				1773.6762 (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	73.1171	64.8657	69.3847	62.0902	60.9362	55.7188	55.5582	57.2954	57.4096	63.0509	65.8693	72.4572 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.8254	85.0567	76.8254	79.3863	76.8254	79.3863	76.8254	76.8254	79.3863	76.8254	79.3863	76.8254 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.2339	148.7618	144.9117	136.7153	126.3689	116.6447	110.1484	108.6205	112.4706	120.6670	131.0134	140.7376 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040 (71)
Water heating gains (Table 5)	98.2757	96.5264	93.2590	86.2364	81.9034	77.3872	74.6750	77.0100	79.7355	84.7459	91.4852	97.3887 (72)
Total internal gains	373.6866	381.6964	366.3477	353.6895	336.4493	321.7697	310.0003	310.8075	319.9439	333.5898	353.2364	366.3032 (73)

6. Solar gains

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[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d	Gains W
Southeast				8.3600	36.7938		0.6300		0.7000		0.7700	94.0055 (77)

Solar gains	94.0055	160.1261	219.0915	271.4650	304.0634	301.8646	291.0297	266.7098	237.2298	176.9734	112.5969	80.4491 (83)
Total gains	467.6921	541.8225	585.4392	625.1545	640.5127	623.6343	601.0300	577.5173	557.1737	510.5633	465.8333	446.7523 (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	76.7597	76.9630	77.1634	78.1185	78.2998	79.1552	79.1552	79.3156	78.8235	78.2998	77.9339	77.5549
alpha	6.1173	6.1309	6.1442	6.2079	6.2200	6.2770	6.2770	6.2877	6.2549	6.2200	6.1956	6.1703
util living area	0.9868	0.9683	0.9312	0.8364	0.6819	0.4921	0.3529	0.3830	0.5900	0.8587	0.9679	0.9896 (86)
MIT	20.2463	20.4400	20.6477	20.8594	20.9654	20.9961	20.9996	20.9993	20.9885	20.8590	20.5288	20.2126 (87)
Th 2	20.0874	20.0896	20.0917	20.1018	20.1037	20.1126	20.1126	20.1142	20.1092	20.1037	20.0999	20.0959 (88)
util rest of house	0.9826	0.9590	0.9123	0.7984	0.6251	0.4254	0.2819	0.3096	0.5182	0.8167	0.9568	0.9863 (89)
MIT 2	19.2339	19.4761	19.7283	19.9743	20.0786	20.1107	20.1125	20.1140	20.1028	19.9812	19.5976	19.1984 (90)
Living area fraction									FLA = Living area / (4) =			0.5200 (91)
MIT	19.7603	19.9773	20.2064	20.4345	20.5397	20.5711	20.5738	20.5744	20.5634	20.4377	20.0818	19.7258 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7603	19.9773	20.2064	20.4345	20.5397	20.5711	20.5738	20.5744	20.5634	20.4377	20.0818	19.7258 (93)

8. Space heating requirement												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9808	0.9576	0.9149	0.8132	0.6533	0.4600	0.3189	0.3478	0.5553	0.8334	0.9566	0.9846 (94)
Useful gains	458.6978	518.8650	535.6270	508.3865	418.4396	286.8959	191.6421	200.8424	309.3898	425.5099	445.6003	439.8629 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	769.2747	748.2346	678.4335	563.9519	431.1956	288.1173	191.7424	201.0145	313.1825	479.8743	636.2169	764.6098 (97)
Space heating kWh	231.0692	154.1364	106.2480	40.0070	9.4905	0.0000	0.0000	0.0000	0.0000	40.4471	137.2439	241.6117 (98a)
Space heating requirement - total per year (kWh/year)												960.2539
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	231.0692	154.1364	106.2480	40.0070	9.4905	0.0000	0.0000	0.0000	0.0000	40.4471	137.2439	241.6117 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												960.2539
Space heating per m2										(98c) / (4) =		19.2051 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Fraction of main heating from main system 2												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												88.8000 (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	231.0692	154.1364	106.2480	40.0070	9.4905	0.0000	0.0000	0.0000	0.0000	40.4471	137.2439	241.6117 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	250.3458	166.9950	115.1116	43.3446	10.2822	0.0000	0.0000	0.0000	0.0000	43.8213	148.6933	261.7678 (211)
Space heating efficiency (main heating system 2)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Space heating fuel used, main system 2												0.0000 (213)
Water heating												
Water heating requirement												
	176.9868	156.3236	165.7615	145.2074	140.3524	126.0454	124.1780	129.4027	131.1304	146.7126	156.5733	175.0020 (64)
Efficiency of water heater												79.8000 (216)
(217)m	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000 (217)
Fuel for water heating, kWh/month	221.7880	195.8943	207.7212	181.9642	175.8802	157.9516	155.6115	162.1588	164.3238	183.8504	196.2071	219.3008 (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	11.1260	10.0493	11.1260	10.7671	11.1260	10.7671	11.1260	11.1260	10.7671	11.1260	10.7671	11.1260 (231)
Lighting	15.9628	12.8060	11.5303	8.4476	6.5252	5.3311	5.9525	7.7373	10.0500	13.1861	14.8937	16.4065 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-6.0753	-9.4228	-14.8863	-18.4564	-21.4845	-20.6591	-20.4221	-18.4814	-15.3661	-11.4959	-6.9800	-5.1582 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-1.2457	-2.7325	-5.6457	-8.8038	-11.9622	-12.1276	-11.9724	-9.9775	-7.1169	-3.9975	-1.6918	-0.9762 (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)

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Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year												
Space heating fuel - main system 1											1040.3617	(211)
Space heating fuel - main system 2											0.0000	(213)
Space heating fuel - secondary											0.0000	(215)
Efficiency of water heater											79.8000	
Water heating fuel used											2222.6518	(219)
Space cooling fuel											0.0000	(221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year											131.0000	(231)
Electricity for lighting (calculated in Appendix L)											128.8290	(232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation											-247.1375	(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											3275.7050	(238)

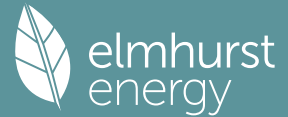
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1040.3617	0.2100	218.4760 (261)
Space heating - main system 2	0.0000	0.2100	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2222.6518	0.2100	466.7569 (264)
Space and water heating			685.2328 (265)
Pumps, fans and electric keep-hot	131.0000	0.1387	18.1713 (267)
Energy for lighting	128.8290	0.1443	18.5940 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-168.8878	0.1326	-22.3994
PV Unit electricity exported	-78.2497	0.1248	-9.7690
Total			-32.1685 (269)
Total CO2, kg/year			689.8297 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.8000 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1040.3617	1.1300	1175.6087 (275)
Space heating - main system 2	0.0000	1.1300	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2222.6518	1.1300	2511.5966 (278)
Space and water heating			3687.2053 (279)
Pumps, fans and electric keep-hot	131.0000	1.5128	198.1768 (281)
Energy for lighting	128.8290	1.5338	197.6023 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-168.8878	1.4901	-251.6533
PV Unit electricity exported	-78.2497	0.4582	-35.8553
Total			-287.5085 (283)
Total Primary energy kWh/year			3795.4758 (286)
Target Primary Energy Rate (TPER)			75.9100 (287)

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Plot Reference	09fir sample 1 Plot 25				Issued on Date	13/12/2025		
Assessment Reference	Block E 2B4P			Plot Type Ref	Block E 2B4P			
Plot Address					SAP Version	10.2		
SAP Rating	87 B		DER	1.61		TER	13.81	
Environmental	99 A		% DER < TER				88.34	
CO ₂ Emissions (t/year)	0.1		DFEE	30.10		TFEE	33.89	
Compliance Check	See BREL		% DFEE < TFEE				11.19	
% DPER < TPER	77.91		DPER	16.63		TPER	75.30	
Assessor Details	Mr. Andrew Jones				Assessor ID	N955-0001		
Client								

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	72.0000 (1b)	2.5000 (2b)	180.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.0000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	180.0000 (5)

2. Ventilation rate

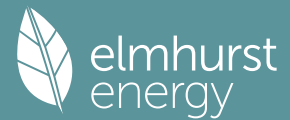
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												86.4000 (23c)
Effective ac	0.2306	0.2274	0.2242	0.2082	0.2051	0.1891	0.1891	0.1859	0.1955	0.2051	0.2114	0.2178 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows Open			12.7500	1.1450	14.5992		(27)
External Wall 1	42.5000	12.7500	29.7500	0.1500	4.4625	70.0000	2082.5000 (29a)
External Roof 1	72.0000		72.0000	0.1100	7.9200	9.0000	648.0000 (30)
Total net area of external elements A _{um} (A, m ²)			114.5000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.9817		(33)
Main dwelling							
Party Wall hall			42.5000	0.0000	0.0000	180.0000	7650.0000 (32)
Party Floor 1			72.0000			40.0000	2880.0000 (32d)
Internal Wall 1			144.2000			9.0000	1297.8000 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		14558.3000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							202.1986 (35)
Thermal bridges (User defined value 0.075 * total exposed area)							8.5875 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss					(33) + (36) + (36a) =		35.5692 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	13.6954	13.5061	13.3167	12.3700	12.1807	11.2340	11.2340	11.0447	11.6127	12.1807	12.5594	12.9381	(38)
Heat transfer coeff	49.2646	49.0753	48.8860	47.9393	47.7499	46.8033	46.8033	46.6139	47.1819	47.7499	48.1286	48.5073	(39)
Average = Sum(39)m / 12 =												47.8920	
HLP	0.6842	0.6816	0.6790	0.6658	0.6632	0.6500	0.6500	0.6474	0.6553	0.6632	0.6685	0.6737	(40)
HLP (average)												0.6652	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2937 (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	72.2582	71.1851	69.6739	66.8875	64.8011	62.4876	61.2380	62.7386	64.3725	66.8480	69.6918	72.0139	(42b)
Hot water usage for other uses	38.1196	36.7335	35.3473	33.9611	32.5749	31.1888	31.1888	32.5749	33.9611	35.3473	36.7335	38.1196	(42c)
Average daily hot water use (litres/day)												101.6490	(43)
Daily hot water use	110.3779	107.9185	105.0212	100.8486	97.3760	93.6764	92.4267	95.3135	98.3336	102.1953	106.4252	110.1336	(44)
Energy conte	174.8115	153.6746	161.4136	138.0567	131.0869	115.1860	111.7821	118.0181	121.2552	138.6781	151.6223	172.4426	(45)
Energy content (annual)										Total = Sum(45)m =		1688.0277	
Distribution loss (46)m = 0.15 x (45)m	26.2217	23.0512	24.2120	20.7085	19.6630	17.2779	16.7673	17.7027	18.1883	20.8017	22.7433	25.8664	(46)
Water storage loss (or HIU loss):													
Store volume												15.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2500	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.1500	(55)
Total storage loss	4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500	(56)
If cylinder contains dedicated solar storage	4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	202.7239	178.8858	189.3260	165.0687	158.9993	142.1980	139.6945	145.9305	148.2672	166.5905	178.6343	200.3550	(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	202.7239	178.8858	189.3260	165.0687	158.9993	142.1980	139.6945	145.9305	148.2672	166.5905	178.6343	200.3550	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2016.6737	(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	80.4548	71.2658	76.0000	67.5135	65.9163	59.9090	59.4975	61.5709	61.9270	68.4404	72.0240	79.6671	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.3945	118.9011	107.3945	110.9743	107.3945	110.9743	107.3945	107.3945	110.9743	107.3945	110.9743	107.3945	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.9192	204.0145	198.7344	187.4938	173.3045	159.9686	151.0594	148.9641	154.2442	165.4848	179.6741	193.0100	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	(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)	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	(71)
Water heating gains (Table 5)	108.1381	106.0502	102.1505	93.7687	88.5972	83.2069	79.9697	82.7566	86.0097	91.9898	100.0333	107.0794	(72)
Total internal gains	474.8571	486.3711	465.6847	449.6421	426.7015	411.5551	395.8289	396.5205	408.6334	422.2743	448.0870	464.8892	(73)

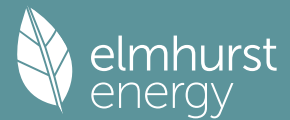
6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
Southwest					8.4500	36.7938		0.4000	0.6000	0.7700		51.7102 (79)	
Northwest					4.3000	11.2829		0.4000	0.6000	0.7700		8.0693 (81)	
Solar gains	59.7795	104.5069	150.1102	197.9269	232.5866	235.6957	225.2420	198.6518	166.5542	117.4219	72.0902	50.8429 (83)	
Total gains	534.6366	590.8779	615.7949	647.5690	659.2881	647.2508	621.0709	595.1724	575.1876	539.6963	520.1772	515.7321 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	82.0867	82.4034	82.7225	84.3561	84.6906	86.4036	86.4036	86.7546	85.7102	84.6906	84.0243	83.3683	
alpha	6.4724	6.4936	6.5148	6.6237	6.6460	6.7602	6.7602	6.7836	6.7140	6.6460	6.6016	6.5579	
util living area													

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	0.9776	0.9569	0.9196	0.8165	0.6568	0.4614	0.3315	0.3600	0.5606	0.8304	0.9504	0.9811 (86)
MIT	20.4153	20.5618	20.7218	20.8995	20.9784	20.9983	20.9998	20.9997	20.9939	20.9051	20.6585	20.3965 (87)
Th 2	20.3548	20.3571	20.3594	20.3711	20.3735	20.3852	20.3852	20.3875	20.3805	20.3735	20.3688	20.3641 (88)
util rest of house												
	0.9729	0.9484	0.9045	0.7883	0.6172	0.4177	0.2852	0.3122	0.5123	0.7984	0.9394	0.9771 (89)
MIT 2	19.8270	19.9707	20.1243	20.2940	20.3593	20.3843	20.3851	20.3874	20.3772	20.3033	20.0754	19.8168 (90)
Living area fraction												
MIT	20.0395	20.1842	20.3401	20.5126	20.5829	20.6060	20.6071	20.6085	20.5999	20.5206	20.2860	20.0261 (93)
Temperature adjustment												
adjusted MIT	20.0395	20.1842	20.3401	20.5126	20.5829	20.6060	20.6071	20.6085	20.5999	20.5206	20.2860	20.0261 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9702	0.9459	0.9041	0.7949	0.6307	0.4334	0.3019	0.3295	0.5295	0.8063	0.9377	0.9746	(94)
Useful gains	518.6812	558.8827	556.7105	514.7623	415.8035	280.5343	187.5055	196.1056	304.5606	435.1323	487.7956	502.6202	(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	775.3989	750.0753	676.5853	556.7008	424.1573	281.1012	187.5454	196.1763	306.6763	473.7095	634.6227	767.6824	(97)
Space heating kWh	190.9979	128.4814	89.1868	30.1957	6.2153	0.0000	0.0000	0.0000	0.0000	28.7015	105.7155	197.2063	(98a)
Space heating requirement - total per year (kWh/year)												776.7004	
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	190.9979	128.4814	89.1868	30.1957	6.2153	0.0000	0.0000	0.0000	0.0000	28.7015	105.7155	197.2063	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												776.7004	
Space heating per m2												10.7875	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (301)
Fraction of space heat from community system													1.0000 (302)
Fraction of heat from community Heat pump-Space													1.0000 (303a)
Fraction of heat from community Heat pump-Water													1.0000 (303b)
Factor for control and charging method (Table 4c(3)) for space heating													1.0500 (305)
Distribution loss factor (Table 12c) for community heating system													1.0000 (306)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating:													
Space heating requirement	190.9979	128.4814	89.1868	30.1957	6.2153	0.0000	0.0000	0.0000	0.0000	28.7015	105.7155	197.2063	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00													
307a	200.5478	134.9055	93.6462	31.7055	6.5260	0.0000	0.0000	0.0000	0.0000	30.1365	111.0013	207.0666	
Space heating requirement	200.5478	134.9055	93.6462	31.7055	6.5260	0.0000	0.0000	0.0000	0.0000	30.1365	111.0013	207.0666	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)													0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	202.7239	178.8858	189.3260	165.0687	158.9993	142.1980	139.6945	145.9305	148.2672	166.5905	178.6343	200.3550	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00													
310b	202.7239	178.8858	189.3260	165.0687	158.9993	142.1980	139.6945	145.9305	148.2672	166.5905	178.6343	200.3550	
Water heating fuel	202.7239	178.8858	189.3260	165.0687	158.9993	142.1980	139.6945	145.9305	148.2672	166.5905	178.6343	200.3550	(310)
Cooling System Energy Efficiency Ratio	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(311)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(312)
Pumps and Fa	13.9882	12.6345	13.9882	13.5370	13.9882	13.5370	13.9882	13.9882	13.5370	13.9882	13.5370	13.9882	(313)
Lighting	23.8327	19.1195	17.2150	12.6124	9.7422	7.9595	8.8872	11.5519	15.0048	19.6871	22.2365	24.4951	(314)
Electricity generated by PVs (Appendix M) (negative quantity)	-11.9297	-18.2812	-28.5962	-35.0847	-40.4666	-38.7730	-38.2906	-34.7963	-29.1431	-22.1085	-13.6205	-10.1485	(315a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(316a)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(316b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(316c)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(316d)
Annual totals kWh/year													
Space heating fuel - community heating													815.5355 (307)
Space heating fuel - secondary													0.0000 (309)
Water heating fuel - community heating													2016.6737 (310)
Efficiency of water heater													0.0000 (311)
Electricity used for heat distribution (space)													8.1554 (313)
Electricity used for heat distribution (water)													2.0035 (313)
Space cooling fuel													0.0000 (321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)													
mechanical ventilation fans (SFP = 0.7500)													164.7000 (330a)
Total electricity for the above, kWh/year													164.7000 (331)
Electricity for lighting (calculated in Appendix L)													192.3439 (332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-321.2388 (333)
Wind generation													0.0000 (334)
Hydro-electric generation (Appendix N)													0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)													0.0000 (335)
Appendix Q - special features													
Energy saved or generated													-0.0000 (336)
Energy used													0.0000 (337)
Total delivered energy for all uses													2868.0142 (338)

12b. Carbon dioxide emissions - Community heating scheme

Energy	Emission factor	Emissions
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	kWh/year	kg CO2/kWh	kg CO2/year
Efficiency of heat source Heat pump			330.0000 (367)
Space heating from Heat pump	247.1320	0.1577	38.9724 (367)
Efficiency of heat source Heat pump			440.0000 (367)
Water heating from Heat pump	458.3349	0.0000	0.0000 (368)
Electrical energy for heat distribution (space & water)	8.1554	0.0000	4.1312 (372)
Overall CO2 factor for heat network (space)			0.0494 (386)
Overall CO2 factor for heat network (water)			0.0335 (386)
Total CO2 associated with community systems			107.7664 (373)
Space and water heating			107.7664 (376)
Pumps, fans and electric keep-hot	164.7000	0.1387	22.8459 (378)
Energy for lighting	192.3439	0.1443	27.7612 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-321.2388	0.1329	-42.6768
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-42.6768 (380)
Total CO2, kg/year			115.6967 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.6100 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			330.0000 (467a)
Space heating from Heat pump	247.1320	1.5838	391.4040 (467)
Efficiency of heat source Heat pump			440.0000 (467b)
Water heating from Heat pump	458.3349	0.0000	0.0000 (468)
Electrical energy for heat distribution (space & water)	8.1554	0.0000	43.6036 (472)
Overall CO2 factor for heat network (space)			0.4958 (486)
Overall CO2 factor for heat network (water)			0.3611 (486)
Total CO2 associated with community systems			1132.4458 (473)
Space and water heating			1132.4458 (476)
Pumps, fans and electric keep-hot	164.7000	1.5128	249.1582 (478)
Energy for lighting	192.3439	1.5338	295.0234 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-321.2388	1.4909	-478.9328
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-478.9328 (480)
Total Primary energy kWh/year			1197.6947 (483)
Dwelling Primary energy Rate (DPER)			16.6300 (484)

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

1. Overall dwelling characteristics

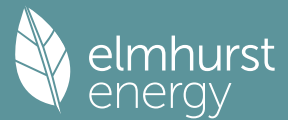
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	72.0000	2.5000	180.0000
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.0000		
Dwelling volume			

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1667 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4167 (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) = 0.3542 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000 (22)
Wind factor	1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 0.9500 0.9250 1.0000 1.0750 1.1250 1.1750 (22a)
Adj infilt rate	0.4516 0.4427 0.4339 0.3896 0.3807 0.3365 0.3365 0.3276 0.3542 0.3807 0.3984 0.4161 (22b)
Effective ac	0.6020 0.5980 0.5941 0.5759 0.5725 0.5566 0.5566 0.5537 0.5627 0.5725 0.5794 0.5866 (25)

3. Heat losses and heat loss parameter

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Element												
Main dwelling												
TER Opening Type												(27)
External Wall 1												(29a)
External Roof 1												(30)
Total net area of external elements Aum(A, m2)												(31)
Fabric heat loss, W/K = Sum (A x U)												(33)
Main dwelling												
Party Wall hall												(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												202.1986 (35)
List of Thermal Bridges												
K1 Element												
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)												
E7 Party floor between dwellings (in blocks of flats)												
E15 Flat roof with parapet												
P4 Party wall - Roof (insulation at ceiling level)												
E1 Steel lintel with perforated steel base plate												
E3 Sill												
E4 Jamb												
E16 Corner (normal)												
E18 Party wall between dwellings												
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												14.9310 (36)
Point Thermal bridges												0.0000
Total fabric heat loss												(33) + (36) + (36a) = 42.8052 (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	35.7561	35.5209	35.2904	34.2077	34.0052	33.0622	33.0622	32.8875	33.4254	34.0052	34.4149	34.8434 (38)
Heat transfer coeff	78.5613	78.3262	78.0957	77.0130	76.8104	75.8674	75.8674	75.6928	76.2306	76.8104	77.2202	77.6486 (39)
Average = Sum(39)m / 12 =												77.0120
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0911	1.0879	1.0847	1.0696	1.0668	1.0537	1.0537	1.0513	1.0588	1.0668	1.0725	1.0785 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

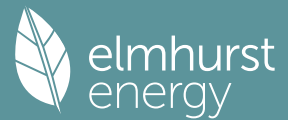
4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.2937 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths												72.2582 (42b)
Hot water usage for other uses												38.1196 (42c)
Average daily hot water use (litres/day)												101.6490 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	110.3779	107.9185	105.0212	100.8486	97.3760	93.6764	92.4267	95.3135	98.3336	102.1953	106.4252	110.1336 (44)
Energy conte	174.8115	153.6746	161.4136	138.0567	131.0869	115.1860	111.7821	118.0181	121.2552	138.6781	151.6223	172.4426 (45)
Energy content (annual)										Total = Sum(45)m =		1688.0277
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss (or HIU loss):												15.0000 (47)
Store volume												0.4337 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Enter (49) or (54) in (55)												0.2342 (55)
Total storage loss												
7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.2595	7.0253	7.2595	7.2595	(56)
If cylinder contains dedicated solar storage												
7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.2595	7.0253	7.2595	7.2595	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
205.3335	181.2428	191.9356	167.5941	161.6088	144.7234	142.3041	148.5400	150.7925	169.2000	181.1596	202.9645 (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												
205.3335	181.2428	191.9356	167.5941	161.6088	144.7234	142.3041	148.5400	150.7925	169.2000	181.1596	202.9645 (64)	
12Total per year (kWh/year)												2047.3988 (64)
Electric shower(s)												2047 (64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
82.5424	73.1513	78.0876	69.5337	68.0039	61.9292	61.5851	63.6586	63.9472	70.5280	74.0443	81.7547 (65)	

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

Metabolic gains (Table 5), Watts												
(66)m	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
104.2974	115.4721	104.2974	107.7739	104.2974	107.7739	104.2974	107.7739	104.2974	107.7739	104.2974	107.7739	104.2974 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
201.9192	204.0145	198.7344	187.4938	173.3045	159.9686	151.0594	148.9641	154.2442	165.4848	179.6741	193.0100 (68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474 (71)
Water heating gains (Table 5)												
110.9441	108.8562	104.9564	96.5746	91.4031	86.0128	82.7757	85.5626	88.8156	94.7957	102.8393	109.8853 (72)	
Total internal gains												
477.5659	488.7480	468.3935	452.2476	429.4103	411.1606	395.5377	396.2293	408.2390	424.9831	450.6926	467.5979 (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
Southwest					8.4500	36.7938	0.6300	0.7000			0.7700	95.0175 (79)
Northwest					4.3000	11.2829	0.6300	0.7000			0.7700	14.8273 (81)
Solar gains	109.8448	192.0314	275.8275	363.6907	427.3779	433.0908	413.8821	365.0227	306.0433	215.7628	132.4657	93.4239 (83)
Total gains	587.4107	680.7794	744.2210	815.9383	856.7882	844.2514	809.4198	761.2520	714.2823	640.7459	583.1582	561.0218 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	51.4754	51.6299	51.7823	52.5103	52.6488	53.3032	53.3032	53.4261	53.0492	52.6488	52.3694	52.0804
util living area	4.4317	4.4420	4.4522	4.5007	4.5099	4.5535	4.5535	4.5617	4.5366	4.5099	4.4913	4.4720
0.9841	0.9692	0.9411	0.8680	0.7373	0.5545	0.4081	0.4503	0.6770	0.8959	0.9694	0.9868	(86)
MIT	19.6963	19.9311	20.2316	20.6009	20.8524	20.9688	20.9937	20.9903	20.9242	20.5986	20.0939	19.6624 (87)
Th 2	20.0081	20.0108	20.0134	20.0257	20.0280	20.0388	20.0388	20.0408	20.0347	20.0280	20.0234	20.0185 (88)
util rest of house	0.9801	0.9617	0.9268	0.8376	0.6833	0.4790	0.3211	0.3598	0.6016	0.8648	0.9607	0.9834 (89)
MIT 2	18.5075	18.8044	19.1789	19.6287	19.9038	20.0198	20.0365	20.0369	19.9825	19.6383	19.0216	18.4720 (90)
Living area fraction	18.9368	19.2113	19.5590	19.9798	20.2463	20.3625	20.3821	20.3812	20.3226	19.9851	19.4088	18.9019 (92)
Temperature adjustment	18.9368	19.2113	19.5590	19.9798	20.2463	20.3625	20.3821	20.3812	20.3226	19.9851	19.4088	0.0000
adjusted MIT	18.9368	19.2113	19.5590	19.9798	20.2463	20.3625	20.3821	20.3812	20.3226	19.9851	19.4088	18.9019 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9744	0.9541	0.9190	0.8360	0.6961	0.5050	0.3525	0.3923	0.6252	0.8632	0.9538	0.9783 (94)
Ext temp.	572.3770	649.5342	683.9407	682.1429	596.4395	426.3775	285.2886	298.6746	446.5929	553.0859	556.1941	548.8720 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Space heating kWh	1149.8845	1120.9463	1019.8548	853.2848	656.4461	437.1874	286.9414	301.3463	474.3507	720.8709	950.4884	1141.5817 (97)
Space heating requirement - total per year (kWh/year)	429.6656	316.7889	249.9201	123.2222	44.6449	0.0000	0.0000	0.0000	0.0000	124.8320	283.8919	440.9761 (98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	429.6656	316.7889	249.9201	123.2222	44.6449	0.0000	0.0000	0.0000	0.0000	124.8320	283.8919	440.9761 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98d)
Space heating per m2	(98c) / (4) =											27.9714 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)											
Fraction of space heat from main system(s)	1.0000 (202)											
Fraction of main heating from main system 2	0.0000 (203)											
Fraction of total heating from main system 1	1.0000 (204)											
Fraction of total heating from main system 2	0.0000 (205)											
Efficiency of main space heating system 1 (in %)	92.3000 (206)											
Efficiency of main space heating system 2 (in %)	88.8000 (207)											
Efficiency of secondary/supplementary heating system, %	0.0000 (208)											
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating efficiency (main heating system 1)	429.6656	316.7889	249.9201	123.2222	44.6449	0.0000	0.0000	0.0000	0.0000	124.8320	283.8919	440.9761 (98)
Space heating fuel (main heating system)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating efficiency (main heating system 2)	465.5099	343.2166	270.7693	133.5019	48.3694	0.0000	0.0000	0.0000	0.0000	135.2460	307.5752	477.7639 (211)
Space heating fuel (main heating system 2)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (212)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating	205.3335	181.2428	191.9356	167.5941	161.6088	144.7234	142.3041	148.5400	150.7925	169.2000	181.1596	202.9645 (64)
Efficiency of water heater	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000 (216)
Fuel for water heating, kWh/month	257.3101	227.1213	240.5208	210.0176	202.5173	181.3576	178.3259	186.1404	188.9631	212.0301	227.0171	254.3415 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	11.1260	10.0493	11.1260	10.7671	11.1260	10.7671	11.1260	11.1260	10.7671	11.1260	10.7671	11.1260 (231)
Lighting	21.6709	17.3852	15.6535	11.4684	8.8585	7.2375	8.0810	10.5040	13.6437	17.9013	20.2195	22.2732 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-8.6804	-13.4250	-21.1464	-26.1314	-30.3306	-29.1209	-28.7748	-26.0762	-21.7403	-16.3335	-9.9567	-7.3733 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-1.8618	-4.0785	-8.4196	-13.1232	-17.8327	-18.0919	-17.8732	-14.9046	-10.6351	-5.9770	-2.5307	-1.4602 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

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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											2181.9521	(211)
Space heating fuel - main system 2											0.0000	(213)
Space heating fuel - secondary											0.0000	(215)
Efficiency of water heater											79.8000	
Water heating fuel used											2565.6626	(219)
Space cooling fuel											0.0000	(221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year											131.0000	(231)
Electricity for lighting (calculated in Appendix L)											174.8968	(232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation											-355.8780	(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											4697.6335	(238)

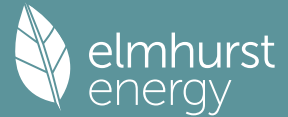
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2181.9521	0.2100	458.2099 (261)
Space heating - main system 2	0.0000	0.2100	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2565.6626	0.2100	538.7892 (264)
Space and water heating			996.9991 (265)
Pumps, fans and electric keep-hot	131.0000	0.1387	18.1713 (267)
Energy for lighting	174.8968	0.1443	25.2430 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-239.0896	0.1327	-31.7268
PV Unit electricity exported	-116.7885	0.1248	-14.5798
Total			-46.3065 (269)
Total CO2, kg/year			994.1069 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.8100 (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	2181.9521	1.1300	2465.6058 (275)
Space heating - main system 2	0.0000	1.1300	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2565.6626	1.1300	2899.1988 (278)
Space and water heating			5364.8046 (279)
Pumps, fans and electric keep-hot	131.0000	1.5128	198.1768 (281)
Energy for lighting	174.8968	1.5338	268.2626 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-239.0896	1.4903	-356.3203
PV Unit electricity exported	-116.7885	0.4582	-53.5117
Total			-409.8320 (283)
Total Primary energy kWh/year			5421.4120 (286)
Target Primary Energy Rate (TPER)			75.3000 (287)

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Plot Reference	09fir sample 2 Plot 26				Issued on Date	13/12/2025
Assessment Reference	Block E 1B2P	Plot Type Ref		Block E 1B2P		
Plot Address					SAP Version	10.2
SAP Rating	86 B	DER	1.42	TER	14.90	
Environmental	99 A	% DER < TER				90.47
CO ₂ Emissions (t/year)	0.06	DFEE	26.63	TFEE	30.89	
Compliance Check	See BREL	% DFEE < TFEE				13.80
% DPER < TPER	82.09	DPER	14.66	TPER	81.85	
Assessor Details	Mr. Andrew Jones				Assessor ID	N955-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	50.0000 (1b)	2.5000 (2b)	125.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	125.0000 (5)

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)

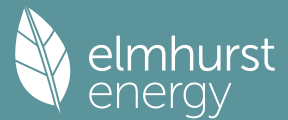
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												86.4000 (23c)
Effective ac	0.2162	0.2133	0.2104	0.1959	0.1930	0.1784	0.1784	0.1755	0.1842	0.1930	0.1988	0.2046 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows Open			7.9600	1.1450	9.1145		(27)
External Wall 1	17.5000	7.9600	9.5400	0.1500	1.4310	70.0000	667.8000 (29a)
External Roof 1	50.0000		50.0000	0.1100	5.5000	9.0000	450.0000 (30)
Total net area of external elements A _{um} (A, m ²)			67.5000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.0455		(33)
Main dwelling							
Party Wall hall			55.0000	0.0000	0.0000	180.0000	9900.0000 (32)
Party Floor 1			50.0000			40.0000	2000.0000 (32d)
Internal Wall 1			84.4500			9.0000	760.0500 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13777.8500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							275.5570 (35)
Thermal bridges (User defined value 0.075 * total exposed area)							5.0625 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	21.1080 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	8.9190	8.7991	8.6793	8.0798	7.9600	7.3605	7.3605	7.2407	7.6003	7.9600	8.1997	8.4395	(38)
Heat transfer coeff	30.0270	29.9071	29.7873	29.1878	29.0680	28.4686	28.4686	28.3487	28.7083	29.0680	29.3077	29.5475	(39)
Average = Sum(39)m / 12 =												29.1579	
HLP	0.6005	0.5981	0.5957	0.5838	0.5814	0.5694	0.5694	0.5670	0.5742	0.5814	0.5862	0.5909	(40)
HLP (average)												0.5832	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6901 (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	60.5412	59.6421	58.3759	56.0413	54.2933	52.3549	51.3079	52.5652	53.9342	56.0083	58.3909	60.3365	(42b)
Hot water usage for other uses	31.9383	30.7769	29.6155	28.4541	27.2927	26.1314	26.1314	27.2927	28.4541	29.6155	30.7769	31.9383	(42c)
Average daily hot water use (litres/day)												85.1660	(43)
Daily hot water use	92.4795	90.4190	87.9914	84.4955	81.5860	78.4863	77.4393	79.8580	82.3883	85.6238	89.1678	92.2748	(44)
Energy conte	146.4649	128.7554	135.2396	115.6701	109.8304	96.5080	93.6561	98.8808	101.5930	116.1907	127.0359	144.4801	(45)
Energy content (annual)										Total = Sum(45)m =		1414.3051	
Distribution loss (46)m = 0.15 x (45)m	21.9697	19.3133	20.2859	17.3505	16.4746	14.4762	14.0484	14.8321	15.2390	17.4286	19.0554	21.6720	(46)
Water storage loss (or HIU loss):													
Store volume												15.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2500	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.1500	(55)
Total storage loss	4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500	(56)
If cylinder contains dedicated solar storage	4.6500	4.2000	4.6500	4.5000	4.6500	4.5000	4.6500	4.6500	4.5000	4.6500	4.5000	4.6500	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	174.3773	153.9666	163.1520	142.6821	137.7428	123.5200	121.5685	126.7932	128.6050	144.1031	154.0479	172.3925	(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	174.3773	153.9666	163.1520	142.6821	137.7428	123.5200	121.5685	126.7932	128.6050	144.1031	154.0479	172.3925	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1742.9511	(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	71.0295	62.9801	67.2971	60.0699	58.8485	53.6985	53.4706	55.2078	55.3893	60.9633	63.8490	70.3695	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.1176	88.7016	80.1176	82.7882	80.1176	82.7882	80.1176	80.1176	82.7882	80.1176	82.7882	80.1176	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.2339	148.7618	144.9117	136.7153	126.3689	116.6447	110.1484	108.6205	112.4706	120.6670	131.0134	140.7376	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	(71)
Water heating gains (Table 5)	95.4698	93.7204	90.4531	83.4304	79.0975	74.5813	71.8690	74.2040	76.9296	81.9400	88.6792	94.5827	(72)
Total internal gains	371.1728	379.5354	363.8339	351.2855	333.9355	322.3657	310.4865	311.2937	320.5399	331.0761	350.8323	363.7894	(73)

6. Solar gains

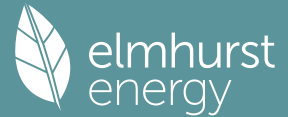
[Jan]					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
-----					Northwest	7.9600	11.2829	0.4000	0.6000	0.7700		14.9376 (81)	

Solar gains	14.9376	30.4059	54.7817	89.9672	120.9336	128.9280	120.6095	96.1513	66.7523	37.1584	18.7953	12.1988	(83)
Total gains	386.1104	409.9412	418.6155	441.2527	454.8692	451.2938	431.0961	407.4450	387.2922	368.2344	369.6277	375.9882	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	127.4579	127.9688	128.4838	131.1224	131.6632	134.4354	134.4354	135.0039	133.3126	131.6632	130.5860	129.5264	
alpha	9.4972	9.5313	9.5656	9.7415	9.7775	9.9624	9.9624	10.0003	9.8875	9.7775	9.7057	9.6351	
util living area	0.9795	0.9607	0.9189	0.7803	0.5928	0.4037	0.2906	0.3201	0.5111	0.7967	0.9443	0.9824	(86)

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MIT	20.7305	20.8083	20.8966	20.9806	20.9985	21.0000	21.0000	21.0000	20.9997	20.9804	20.8721	20.7218 (87)
Th 2	20.4295	20.4317	20.4338	20.4446	20.4468	20.4576	20.4576	20.4598	20.4533	20.4468	20.4425	20.4382 (88)
util rest of house	0.9740	0.9512	0.9014	0.7498	0.5581	0.3695	0.2547	0.2825	0.4708	0.7615	0.9300	0.9777 (89)
MIT 2	20.1929	20.2686	20.3514	20.4313	20.4460	20.4576	20.4576	20.4598	20.4532	20.4341	20.3388	20.1924 (90)
Living area fraction									fLA = Living area / (4) =			0.5200 (91)
MIT	20.4725	20.5492	20.6349	20.7169	20.7333	20.7396	20.7397	20.7407	20.7374	20.7182	20.6161	20.4677 (92)
Temperature adjustment												0.0000
adjusted MIT	20.4725	20.5492	20.6349	20.7169	20.7333	20.7396	20.7397	20.7407	20.7374	20.7182	20.6161	20.4677 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9745	0.9533	0.9079	0.7650	0.5761	0.3873	0.2734	0.3020	0.4918	0.7791	0.9347	0.9780	(94)
Useful gains	376.2578	390.8148	380.0798	337.5541	262.0626	174.7785	117.8502	123.0528	190.4609	286.8981	345.5057	367.6995	(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	485.6110	468.0237	421.0392	344.9098	262.5794	174.7869	117.8504	123.0533	190.5480	294.1143	396.1269	480.6702	(97)
Space heating kWh	81.3588	51.8844	30.4738	5.2962	0.3845	0.0000	0.0000	0.0000	0.0000	5.3688	36.4472	84.0502	(98a)
Space heating requirement - total per year (kWh/year)												295.2639	
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	81.3588	51.8844	30.4738	5.2962	0.3845	0.0000	0.0000	0.0000	0.0000	5.3688	36.4472	84.0502	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												295.2639	
Space heating per m2											(98c) / (4) =	5.9053	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)
Fraction of space heat from community system												1.0000 (302)
Fraction of heat from community Heat pump-Space												1.0000 (303a)
Fraction of heat from community Heat pump-Water												1.0000 (303b)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500 (305)
Distribution loss factor (Table 12c) for community heating system												1.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	81.3588	51.8844	30.4738	5.2962	0.3845	0.0000	0.0000	0.0000	0.0000	5.3688	36.4472	84.0502 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00												
307a	85.4267	54.4786	31.9975	5.5610	0.4037	0.0000	0.0000	0.0000	0.0000	5.6373	38.2696	88.2527
Space heating requirement	85.4267	54.4786	31.9975	5.5610	0.4037	0.0000	0.0000	0.0000	0.0000	5.6373	38.2696	88.2527 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement	174.3773	153.9666	163.1520	142.6821	137.7428	123.5200	121.5685	126.7932	128.6050	144.1031	154.0479	172.3925 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00												
310b	174.3773	153.9666	163.1520	142.6821	137.7428	123.5200	121.5685	126.7932	128.6050	144.1031	154.0479	172.3925
Water heating fuel	174.3773	153.9666	163.1520	142.6821	137.7428	123.5200	121.5685	126.7932	128.6050	144.1031	154.0479	172.3925 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	9.7140	8.7740	9.7140	9.4007	9.7140	9.4007	9.7140	9.7140	9.4007	9.7140	9.4007	9.7140 (331)
Lighting	17.7795	14.2634	12.8426	9.4090	7.2678	5.9379	6.6299	8.6178	11.1937	14.6868	16.5887	18.2737 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-11.4813	-17.3463	-26.7544	-32.3531	-36.9056	-35.2244	-34.8011	-31.8324	-26.9518	-20.7977	-13.0289	-9.7944 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												310.0271 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												1742.9511 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution (space)												3.1003 (313)
Electricity used for heat distribution (water)												1.7239 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)												
mechanical ventilation fans (SFP = 0.7500)												114.3750 (330a)
Total electricity for the above, kWh/year												114.3750 (331)
Electricity for lighting (calculated in Appendix L)												143.4908 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-297.2713 (333)
Wind generation												0.0000 (334)
Hydro-electric generation (Appendix N)												0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (335)
Appendix Q - special features												
Energy saved or generated												-0.0000 (336)
Energy used												0.0000 (337)
Total delivered energy for all uses												2013.5727 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
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Efficiency of heat source Heat pump			330.0000 (367)
Space heating from Heat pump	93.9476	0.1591	14.9442 (367)
Efficiency of heat source Heat pump			440.0000 (367)
Water heating from Heat pump	396.1252	0.0000	0.0000 (368)
Electrical energy for heat distribution (space & water)	3.1003	0.0000	2.9509 (372)
Overall CO2 factor for heat network (space)			0.0498 (386)
Overall CO2 factor for heat network (water)			0.0335 (386)
Total CO2 associated with community systems			73.7524 (373)
Space and water heating			73.7524 (376)
Pumps, fans and electric keep-hot	114.3750	0.1387	15.8652 (378)
Energy for lighting	143.4908	0.1443	20.7102 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-297.2713	0.1331	-39.5738
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-39.5738 (380)
Total CO2, kg/year			70.7540 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.4200 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			330.0000 (467a)
Space heating from Heat pump	93.9476	1.5888	149.2662 (467)
Efficiency of heat source Heat pump			440.0000 (467b)
Water heating from Heat pump	396.1252	0.0000	0.0000 (468)
Electrical energy for heat distribution (space & water)	3.1003	0.0000	31.4432 (472)
Overall CO2 factor for heat network (space)			0.4974 (486)
Overall CO2 factor for heat network (water)			0.3610 (486)
Total CO2 associated with community systems			783.3770 (473)
Space and water heating			783.3770 (476)
Pumps, fans and electric keep-hot	114.3750	1.5128	173.0265 (478)
Energy for lighting	143.4908	1.5338	220.0910 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-297.2713	1.4919	-443.5045
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-443.5045 (480)
Total Primary energy kWh/year			732.9900 (483)
Dwelling Primary energy Rate (DPER)			14.6600 (484)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	50.0000 (1b)	2.5000 (2b)	125.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	125.0000 (5)

2. Ventilation rate

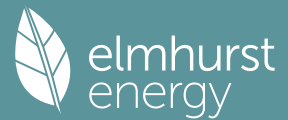
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1600 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4100 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (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	0.4051	0.3972	0.3892	0.3495	0.3416	0.3019	0.3019	0.2939	0.3178	0.3416	0.3575	0.3734 (22b)
Effective ac	0.5821	0.5789	0.5758	0.5611	0.5583	0.5456	0.5456	0.5432	0.5505	0.5583	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
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Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K
TER Opening Type			7.9600	1.1450	9.1145		(27)
External Wall 1	17.5000	7.9600	9.5400	0.1800	1.7172		(29a)
External Roof 1	50.0000		50.0000	0.1100	5.5000		(30)
Total net area of external elements Aum(A, m2)			67.5000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.3317		(33)
Main dwelling							
Party Wall hall			55.0000	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 275.5570 (35)

List of Thermal Bridges							
K1 Element	Length	Psi-value	Total				
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	22.0000	0.0000	0.0000				
E7 Party floor between dwellings (in blocks of flats)	7.0000	0.0700	0.4900				
E1 Steel lintel with perforated steel base plate	3.8000	0.0500	0.1900				
E3 Sill	3.8000	0.0500	0.1900				
E4 Jamb	8.2000	0.0500	0.4100				
E18 Party wall between dwellings	10.0000	0.0600	0.6000				
E15 Flat roof with parapet	7.0000	0.5600	3.9200				
P4 Party wall - Roof (insulation at ceiling level)	22.0000	0.1200	2.6400				

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.4400 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 24.7717 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	24.0102	23.8788	23.7499	23.1447	23.0315	22.5044	22.5044	22.4068	22.7074	23.0315	23.2605	23.5000
Average = Sum(39)m / 12 =	48.7819	48.6505	48.5216	47.9164	47.8032	47.2761	47.2761	47.1785	47.4791	47.8032	48.0322	48.2717
HLP	0.9756	0.9730	0.9704	0.9583	0.9561	0.9455	0.9455	0.9436	0.9496	0.9561	0.9606	0.9654
HLP (average)												0.9583
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

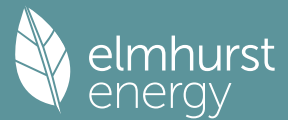
Assumed occupancy													1.6901 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	60.5412	59.6421	58.3759	56.0413	54.2933	52.3549	51.3079	52.5652	53.9342	56.0083	58.3909	60.3365	(42b)
Hot water usage for other uses	31.9383	30.7769	29.6155	28.4541	27.2927	26.1314	26.1314	27.2927	28.4541	29.6155	30.7769	31.9383	(42c)
Average daily hot water use (litres/day)													85.1660 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	92.4795	90.4190	87.9914	84.4955	81.5860	78.4863	77.4393	79.8580	82.3883	85.6238	89.1678	92.2748	(44)
Energy content (annual)	146.4649	128.7554	135.2396	115.6701	109.8304	96.5080	93.6561	98.8808	101.5930	116.1907	127.0359	144.4801	(45)
Distribution loss (46)m = 0.15 x (45)m	21.9697	19.3133	20.2859	17.3505	16.4746	14.4762	14.0484	14.8321	15.2390	17.4286	19.0554	21.6720	(46)
Water storage loss (or HIU loss):													15.0000 (47)
Store volume													0.4337 (48)
a) If manufacturer declared loss factor is known (kWh/day):													0.5400 (49)
Temperature factor from Table 2b													0.2342 (55)
Enter (49) or (54) in (55)													
Total storage loss	7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595	(56)
If cylinder contains dedicated solar storage	7.2595	6.5570	7.2595	7.0253	7.2595	7.0253	7.2595	7.2595	7.0253	7.2595	7.0253	7.2595	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	176.9868	156.3236	165.7615	145.2074	140.3524	126.0454	124.1780	129.4027	131.1304	146.7126	156.5733	175.0020	(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	176.9868	156.3236	165.7615	145.2074	140.3524	126.0454	124.1780	129.4027	131.1304	146.7126	156.5733	175.0020	(64)
12Total per year (kWh/year)													1773.6762 (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	73.1171	64.8657	69.3847	62.0902	60.9362	55.7188	55.5582	57.2954	57.4096	63.0509	65.8693	72.4572	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	77.5536	85.8629	77.5536	80.1387	77.5536	80.1387	77.5536	77.5536	80.1387	77.5536	80.1387	77.5536	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	147.2339	148.7618	144.9117	136.7153	126.3689	116.6447	110.1484	108.6205	112.4706	120.6670	131.0134	140.7376	(68)
Pumps, fans	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	(69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Water heating gains (Table 5)	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	(71)
Total internal gains	98.2757	96.5264	93.2590	86.2364	81.9034	77.3872	74.6750	77.0100	79.7355	84.7459	91.4852	97.3887	(72)
	374.4147	382.5026	367.0758	354.4419	337.1774	322.5221	310.7284	311.5356	320.6963	334.3180	353.9888	367.0313	(73)

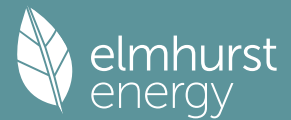
6. Solar gains

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[Jan]	Area m2				Solar flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d	Gains W
Northwest	7.9600				11.2829		0.6300		0.7000		0.7700	27.4478 (81)
Solar gains	27.4478	55.8707	100.6613	165.3148	222.2155	236.9053	221.6200	176.6781	122.6574	68.2785	34.5364	22.4152 (83)
Total gains	401.8625	438.3733	467.7371	519.7567	559.3930	559.4274	532.3485	488.2137	443.3537	402.5965	388.5252	389.4466 (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	78.4549	78.6669	78.8758	79.8720	80.0612	80.9539	80.9539	81.1214	80.6077	80.0612	79.6794	79.2841
alpha	6.2303	6.2445	6.2584	6.3248	6.3374	6.3969	6.3969	6.4081	6.3738	6.3374	6.3120	6.2856
util living area	0.9938	0.9881	0.9725	0.9059	0.7480	0.5359	0.3902	0.4431	0.7075	0.9366	0.9860	0.9948 (86)
MIT	20.1513	20.2841	20.4913	20.7766	20.9464	20.9943	20.9994	20.9986	20.9714	20.7537	20.4169	20.1329 (87)
Th 2	20.1037	20.1059	20.1080	20.1182	20.1201	20.1290	20.1290	20.1306	20.1256	20.1201	20.1163	20.1122 (88)
util rest of house	0.9917	0.9841	0.9633	0.8776	0.6920	0.4653	0.3133	0.3602	0.6307	0.9106	0.9806	0.9931 (89)
MIT 2	19.1270	19.2969	19.5576	19.9040	20.0796	20.1261	20.1288	20.1302	20.1085	19.8872	19.4742	19.1103 (90)
Living area fraction	19.6596	19.8102	20.0431	20.3578	20.5304	20.5776	20.5815	20.5818	20.5572	20.3378	19.9644	19.6421 (91)
MIT	19.6596	19.8102	20.0431	20.3578	20.5304	20.5776	20.5815	20.5818	20.5572	20.3378	19.9644	19.6421 (92)
Temperature adjustment	19.6596	19.8102	20.0431	20.3578	20.5304	20.5776	20.5815	20.5818	20.5572	20.3378	19.9644	19.6421 (93)
adjusted MIT	19.6596	19.8102	20.0431	20.3578	20.5304	20.5776	20.5815	20.5818	20.5572	20.3378	19.9644	19.6421 (93)
8. Space heating requirement												
Utilisation	0.9903	0.9825	0.9625	0.8859	0.7190	0.5020	0.3533	0.4034	0.6698	0.9178	0.9795	0.9919 (94)
Useful gains	397.9773	430.7033	450.1931	460.4735	402.2037	280.8144	188.0718	196.9357	296.9381	369.5148	380.5448	386.2764 (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	749.2719	725.3901	657.1345	549.0166	422.1191	282.5978	188.2293	197.2898	306.5826	465.4978	617.9064	745.4150 (97)
Space heating kWh	261.3632	198.0295	153.9644	63.7510	14.8171	0.0000	0.0000	0.0000	0.0000	71.4114	170.9004	267.1991 (98a)
Space heating requirement - total per year (kWh/year)	261.3632	198.0295	153.9644	63.7510	14.8171	0.0000	0.0000	0.0000	0.0000	71.4114	170.9004	1201.4360
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Space heating kWh	261.3632	198.0295	153.9644	63.7510	14.8171	0.0000	0.0000	0.0000	0.0000	71.4114	170.9004	267.1991 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	261.3632	198.0295	153.9644	63.7510	14.8171	0.0000	0.0000	0.0000	0.0000	71.4114	170.9004	1201.4360
Space heating per m2										(98c) / (4) =		24.0287 (99)
9a. Energy requirements - Individual heating systems, including micro-CHP												
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Fraction of main heating from main system 2												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												88.8000 (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	261.3632	198.0295	153.9644	63.7510	14.8171	0.0000	0.0000	0.0000	0.0000	71.4114	170.9004	267.1991 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	283.1671	214.5499	166.8087	69.0693	16.0532	0.0000	0.0000	0.0000	0.0000	77.3688	185.1575	289.4898 (211)
Space heating efficiency (main heating system 2)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Water heating												
Water heating requirement												175.0020 (64)
Efficiency of water heater	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000 (216)
Fuel for water heating, kWh/month	221.7880	195.8943	207.7212	181.9642	175.8802	157.9516	155.6115	162.1588	164.3238	183.8504	196.2071	219.3008 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	11.1260	10.0493	11.1260	10.7671	11.1260	10.7671	11.1260	11.1260	10.7671	11.1260	10.7671	11.1260 (231)
Lighting	16.1141	12.9273	11.6396	8.5277	6.5870	5.3817	6.0089	7.8106	10.1452	13.3111	15.0348	16.5620 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-6.0757	-9.4236	-14.8876	-18.4580	-21.4862	-20.6606	-20.4238	-18.4833	-15.3679	-11.4971	-6.9806	-5.1585 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-1.2453	-2.7317	-5.6443	-8.8022	-11.9605	-12.1260	-11.9706	-9.9756	-7.1151	-3.9962	-1.6912	-0.9759 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

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(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1301.6642	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2222.6518	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												131.0000	(231)
Electricity for lighting (calculated in Appendix L)												130.0500	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-247.1375	(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												3538.2285	(238)

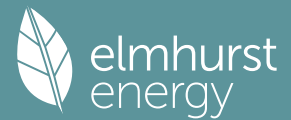
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1301.6642	0.2100	273.3495 (261)
Space heating - main system 2	0.0000	0.2100	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2222.6518	0.2100	466.7569 (264)
Space and water heating			740.1064 (265)
Pumps, fans and electric keep-hot	131.0000	0.1387	18.1713 (267)
Energy for lighting	130.0500	0.1443	18.7702 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-168.9030	0.1326	-22.4014
PV Unit electricity exported	-78.2345	0.1248	-9.7671
Total			-32.1685 (269)
Total CO2, kg/year			744.8794 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.9000 (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	1301.6642	1.1300	1470.8805 (275)
Space heating - main system 2	0.0000	1.1300	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2222.6518	1.1300	2511.5966 (278)
Space and water heating			3982.4771 (279)
Pumps, fans and electric keep-hot	131.0000	1.5128	198.1768 (281)
Energy for lighting	130.0500	1.5338	199.4751 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-168.9030	1.4901	-251.6759
PV Unit electricity exported	-78.2345	0.4582	-35.8479
Total			-287.5238 (283)
Total Primary energy kWh/year			4092.6052 (286)
Target Primary Energy Rate (TPER)			81.8500 (287)

Block Compliance



Block Reference	MO 251024 Be Lean	Issued on Date	13/12/2025
Block Name			
Calculation Type	New Build (As Designed)	SAP Version	10.2

Assessor Details	Mr. Andrew Jones	Assessor ID	N955-0001
Client			

Block Compliance Report - DER				
Block Reference: MO 251024 Be Lean		Block Name:		
Property-Assessment Reference	Floor area (m ²)	DER (kgCO ₂ /m ²)	TER (kgCO ₂ /m ²)	% DER/TER
00grd sample 1 Plot 01 - Block B 2B3P W	77.00	10.40	13.73	24.25 %
00grd sample 2 Plot 02 - Block C 3B5P D	96.00	10.52	9.74	-8.01 %
00grd sample 3 Plot 03 - Block E 4B7P D	120.00	8.27	8.25	-0.24 %
00grd sample 4 Plot 04 - Block E 1B2P	50.00	11.44	15.68	27.04 %
00grd sample 5 Plot 05 - Block E 3B4P W	97.00	9.37	12.76	26.57 %
02flr sample 1 Plot 06 - Block C 2B4P	72.00	8.90	11.91	25.27 %
02flr sample 2 Plot 07 - Block C 2B4P	68.00	9.20	11.89	22.62 %
02flr sample 3 Plot 08 - Block D 3B5P	86.00	8.18	11.28	27.48 %
02flr sample 4 Plot 09 - Block E 2B4P	72.00	8.22	11.70	29.74 %
02flr sample 5 Plot 10 - Block E 1B2P	50.00	9.23	12.65	27.04 %
02flr sample 6 Plot 11 - Block F 3B5P	85.50	8.71	11.81	26.25 %
05flr sample 1 Plot 12 - Block B 1B2P	50.00	10.78	14.24	24.30 %
05flr sample 2 Plot 13 - Block C 1 2B4P	72.00	10.81	14.97	27.79 %
05flr sample 3 Plot 14 - Block D 3B5P	86.00	9.67	13.39	27.78 %
05flr sample 4 Plot 15 - Block E 2B4P	72.00	8.78	11.76	25.34 %
05flr sample 5 Plot 16 - Block E 1B2P	50.00	10.05	12.65	20.55 %
05flr sample 6 Plot 17 - Block F 3B5P	85.50	7.83	10.09	22.40 %
06flr sample 1 Plot 18 - Block F 3B5P	85.50	9.71	12.62	23.06 %
07flr sample 1 Plot 19 - Block E 2B4P	72.00	8.61	11.40	24.47 %
07flr sample 2 Plot 20 - Block E 1B2P	50.00	10.04	12.08	16.89 %
07flr sample 3 Plot 21 - Block E 1B2P	50.00	11.32	15.50	26.97 %
07flr sample 4 Plot 22 - Block F 3B5P	85.50	8.99	11.81	23.88 %

Block Compliance

08flr sample 1 Plot 23 - Block F 3B5P	85.50	11.28	14.78	23.68 %
08flr sample 2 Plot 24 - Block F 1B2P	50.00	10.96	14.39	23.84 %
09flr sample 1 Plot 25 - Block E 2B4P	72.00	10.50	14.36	26.88 %
09flr sample 2 Plot 26 - Block E 1B2P	50.00	11.32	15.50	26.97 %
Totals:	1889.50	253.09	330.94	
Average DER = 9.59 kgCO ₂ /m ²	% DER/TER	PASS		
Average TER = 12.43 kgCO ₂ /m ²	22.83 %			

Block Compliance Report - DFEE				
Block Reference: MO 251024 Be Lean		Block Name:		
Property-Assessment Reference	Floor area (m ²)	DFEE (kWh/m ² /yr)	TFEE (kWh/m ² /yr)	% DFEE/TFEE
00grd sample 1 Plot 01 - Block B 2B3P W	77.00	34.26	32.37	-5.84 %
00grd sample 2 Plot 02 - Block C 3B5P D	96.00	38.01	31.72	-19.83 %
00grd sample 3 Plot 03 - Block E 4B7P D	120.00	32.18	29.73	-8.22 %
00grd sample 4 Plot 04 - Block E 1B2P	50.00	27.61	31.97	13.64 %
00grd sample 5 Plot 05 - Block E 3B4P W	97.00	32.87	32.52	-1.08 %
02flr sample 1 Plot 06 - Block C 2B4P	72.00	22.13	23.22	4.69 %
02flr sample 2 Plot 07 - Block C 2B4P	68.00	21.96	21.83	-0.61 %
02flr sample 3 Plot 08 - Block D 3B5P	86.00	22.15	24.06	7.93 %
02flr sample 4 Plot 09 - Block E 2B4P	72.00	20.98	22.05	4.84 %
02flr sample 5 Plot 10 - Block E 1B2P	50.00	15.81	18.05	12.38 %
02flr sample 6 Plot 11 - Block F 3B5P	85.50	26.48	27.23	2.76 %
05flr sample 1 Plot 12 - Block B 1B2P	50.00	22.39	25.23	11.25 %
05flr sample 2 Plot 13 - Block C 1 2B4P	72.00	31.92	36.54	12.65 %
05flr sample 3 Plot 14 - Block D 3B5P	86.00	31.19	34.00	8.25 %
05flr sample 4 Plot 15 - Block E 2B4P	72.00	21.20	22.38	5.27 %
05flr sample 5 Plot 16 - Block E 1B2P	50.00	15.81	18.05	12.38 %

Block Compliance

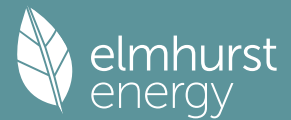
05flr sample 6 Plot 17 - Block F 3B5P	85.50	19.16	19.17	0.05 %
06flr sample 1 Plot 18 - Block F 3B5P	85.50	29.04	30.57	5.00 %
07flr sample 1 Plot 19 - Block E 2B4P	72.00	19.79	20.56	3.74 %
07flr sample 2 Plot 20 - Block E 1B2P	50.00	11.47	14.19	19.16 %
07flr sample 3 Plot 21 - Block E 1B2P	50.00	26.63	30.89	13.80 %
07flr sample 4 Plot 22 - Block F 3B5P	85.50	26.32	27.21	3.27 %
08flr sample 1 Plot 23 - Block F 3B5P	85.50	36.24	40.63	10.79 %
08flr sample 2 Plot 24 - Block F 1B2P	50.00	23.54	26.06	9.68 %
09flr sample 1 Plot 25 - Block E 2B4P	72.00	30.10	33.89	11.19 %
09flr sample 2 Plot 26 - Block E 1B2P	50.00	26.63	30.89	13.80 %
Totals:	1889.50	665.88	705.01	
Average DFEE = 26.55 kWh/m ² /yr	% DFEE/TFEE	PASS		
Average TFEE = 27.68 kWh/m ² /yr	4.09 %			

Block Compliance Report - DPER				
Block Reference: MO 251024 Be Lean	Block Name:			
Property-Assessment Reference	Floor area (m ²)	DPER (kWh/m ² /yr)	TPER (kWh/m ² /yr)	% DPER/TPER
00grd sample 1 Plot 01 - Block B 2B3P W	77.00	66.08	74.35	11.12 %
00grd sample 2 Plot 02 - Block C 3B5P D	96.00	65.14	50.56	-28.84 %
00grd sample 3 Plot 03 - Block E 4B7P D	120.00	51.90	42.76	-21.38 %
00grd sample 4 Plot 04 - Block E 1B2P	50.00	79.89	85.35	6.40 %
00grd sample 5 Plot 05 - Block E 3B4P W	97.00	59.11	69.03	14.37 %
02flr sample 1 Plot 06 - Block C 2B4P	72.00	61.64	64.59	4.57 %
02flr sample 2 Plot 07 - Block C 2B4P	68.00	63.87	64.56	1.07 %
02flr sample 3 Plot 08 - Block D 3B5P	86.00	55.88	61.06	8.48 %
02flr sample 4 Plot 09 - Block E 2B4P	72.00	54.80	63.47	13.66 %
02flr sample 5 Plot 10 - Block E 1B2P	50.00	63.42	69.06	8.17 %
02flr sample 6 Plot 11 - Block F 3B5P	85.50	56.03	63.88	12.29 %

Block Compliance

05flr sample 1 Plot 12 - Block B 1B2P	50.00	76.38	77.66	1.65 %
05flr sample 2 Plot 13 - Block C 1 2B4P	72.00	71.96	81.06	11.23 %
05flr sample 3 Plot 14 - Block D 3B5P	86.00	61.17	72.38	15.49 %
05flr sample 4 Plot 15 - Block E 2B4P	72.00	61.00	63.81	4.40 %
05flr sample 5 Plot 16 - Block E 1B2P	50.00	72.41	69.06	-4.85 %
05flr sample 6 Plot 17 - Block F 3B5P	85.50	54.03	54.61	1.06 %
06flr sample 1 Plot 18 - Block F 3B5P	85.50	64.11	68.24	6.05 %
07flr sample 1 Plot 19 - Block E 2B4P	72.00	60.14	61.85	2.76 %
07flr sample 2 Plot 20 - Block E 1B2P	50.00	72.66	66.26	-9.66 %
07flr sample 3 Plot 21 - Block E 1B2P	50.00	79.28	84.40	6.07 %
07flr sample 4 Plot 22 - Block F 3B5P	85.50	60.19	63.85	5.73 %
08flr sample 1 Plot 23 - Block F 3B5P	85.50	72.53	79.84	9.16 %
08flr sample 2 Plot 24 - Block F 1B2P	50.00	77.30	78.40	1.40 %
09flr sample 1 Plot 25 - Block E 2B4P	72.00	70.29	77.83	9.69 %
09flr sample 2 Plot 26 - Block E 1B2P	50.00	79.28	84.40	6.07 %
Totals:	1889.50	1710.49	1792.32	
Average DPER = 64.21 kWh/m ² /yr	% DPER/TPER	PASS		
Average TPER = 67.19 kWh/m ² /yr	4.43 %			

Block Compliance



Block Reference	MO 251024 Proposed	Issued on Date	13/12/2025
Block Name			
Calculation Type	New Build (As Designed)	SAP Version	10.2

Assessor Details	Mr. Andrew Jones	Assessor ID	N955-0001
Client			

Block Compliance Report - DER				
Block Reference: MO 251024 Proposed		Block Name:		
Property-Assessment Reference	Floor area (m ²)	DER (kgCO ₂ /m ²)	TER (kgCO ₂ /m ²)	% DER/TER
00grd sample 1 Plot 01 - Block B 2B3P W	77.00	1.74	13.15	86.77 %
05flr sample 1 Plot 12 - Block B 1B2P	50.00	1.30	13.64	90.47 %
05flr sample 2 Plot 13 - Block C 1 2B4P	72.00	1.67	14.41	88.41 %
02flr sample 1 Plot 06 - Block C 2B4P	72.00	1.25	11.29	88.93 %
02flr sample 2 Plot 07 - Block C 2B4P	68.00	1.26	11.23	88.78 %
00grd sample 2 Plot 02 - Block C 3B5P D	96.00	1.90	9.30	79.57 %
02flr sample 3 Plot 08 - Block D 3B5P	86.00	1.20	10.75	88.84 %
05flr sample 3 Plot 14 - Block D 3B5P	86.00	1.63	12.93	87.39 %
00grd sample 4 Plot 04 - Block E 1B2P	50.00	1.44	15.06	90.44 %
02flr sample 5 Plot 10 - Block E 1B2P	50.00	1.12	11.98	90.65 %
05flr sample 5 Plot 16 - Block E 1B2P	50.00	1.12	11.98	90.65 %
07flr sample 2 Plot 20 - Block E 1B2P	50.00	1.16	11.39	89.82 %
07flr sample 3 Plot 21 - Block E 1B2P	50.00	1.42	14.90	90.47 %
09flr sample 2 Plot 26 - Block E 1B2P	50.00	1.42	14.90	90.47 %
02flr sample 4 Plot 09 - Block E 2B4P	72.00	1.21	11.07	89.07 %
05flr sample 4 Plot 15 - Block E 2B4P	72.00	1.22	11.14	89.05 %
07flr sample 1 Plot 19 - Block E 2B4P	72.00	1.19	10.76	88.94 %
09flr sample 1 Plot 25 - Block E 2B4P	72.00	1.61	13.81	88.34 %
00grd sample 5 Plot 05 - Block E 3B4P W	97.00	1.68	12.33	86.37 %
00grd sample 3 Plot 03 - Block E 4B7P D	120.00	1.55	7.93	80.45 %
08flr sample 2 Plot 24 - Block F 1B2P	50.00	1.33	13.80	90.36 %
02flr sample 6 Plot 11 - Block F 3B5P	85.50	1.39	11.30	87.70 %

Block Compliance

05flr sample 6 Plot 17 - Block F 3B5P	85.50	1.13	9.55	88.17 %
06flr sample 1 Plot 18 - Block F 3B5P	85.50	1.54	12.15	87.33 %
07flr sample 4 Plot 22 - Block F 3B5P	85.50	1.38	11.30	87.79 %
08flr sample 1 Plot 23 - Block F 3B5P	85.50	1.88	14.33	86.88 %
Totals:	1889.50	36.74	316.38	
Average DER = 1.44 kgCO ₂ /m ²	% DER/TER	PASS		
Average TER = 11.89 kgCO ₂ /m ²	87.88 %			

Block Compliance Report - DFEE				
Block Reference: MO 251024 Proposed		Block Name:		
Property-Assessment Reference	Floor area (m ²)	DFEE (kWh/m ² /yr)	TFEE (kWh/m ² /yr)	% DFEE/TFEE
00grd sample 1 Plot 01 - Block B 2B3P W	77.00	34.26	32.37	-5.84 %
05flr sample 1 Plot 12 - Block B 1B2P	50.00	22.39	25.23	11.25 %
05flr sample 2 Plot 13 - Block C 1 2B4P	72.00	31.92	36.54	12.65 %
02flr sample 1 Plot 06 - Block C 2B4P	72.00	22.13	23.22	4.69 %
02flr sample 2 Plot 07 - Block C 2B4P	68.00	21.96	21.83	-0.61 %
00grd sample 2 Plot 02 - Block C 3B5P D	96.00	38.01	31.72	-19.83 %
02flr sample 3 Plot 08 - Block D 3B5P	86.00	22.15	24.06	7.93 %
05flr sample 3 Plot 14 - Block D 3B5P	86.00	31.19	34.00	8.25 %
00grd sample 4 Plot 04 - Block E 1B2P	50.00	27.61	31.97	13.64 %
02flr sample 5 Plot 10 - Block E 1B2P	50.00	15.81	18.05	12.38 %
05flr sample 5 Plot 16 - Block E 1B2P	50.00	15.81	18.05	12.38 %
07flr sample 2 Plot 20 - Block E 1B2P	50.00	11.47	14.19	19.16 %
07flr sample 3 Plot 21 - Block E 1B2P	50.00	26.63	30.89	13.80 %
09flr sample 2 Plot 26 - Block E 1B2P	50.00	26.63	30.89	13.80 %
02flr sample 4 Plot 09 - Block E 2B4P	72.00	20.98	22.05	4.84 %
05flr sample 4 Plot 15 - Block E 2B4P	72.00	21.20	22.38	5.27 %

Block Compliance

07flr sample 1 Plot 19 - Block E 2B4P	72.00	19.79	20.56	3.74 %
09flr sample 1 Plot 25 - Block E 2B4P	72.00	30.10	33.89	11.19 %
00grd sample 5 Plot 05 - Block E 3B4P W	97.00	32.87	32.52	-1.08 %
00grd sample 3 Plot 03 - Block E 4B7P D	120.00	32.18	29.73	-8.22 %
08flr sample 2 Plot 24 - Block F 1B2P	50.00	23.54	26.06	9.68 %
02flr sample 6 Plot 11 - Block F 3B5P	85.50	26.48	27.23	2.76 %
05flr sample 6 Plot 17 - Block F 3B5P	85.50	19.16	19.17	0.05 %
06flr sample 1 Plot 18 - Block F 3B5P	85.50	29.04	30.57	5.00 %
07flr sample 4 Plot 22 - Block F 3B5P	85.50	26.32	27.21	3.27 %
08flr sample 1 Plot 23 - Block F 3B5P	85.50	36.24	40.63	10.79 %
Totals:	1889.50	665.88	705.01	
Average DFEE = 26.55 kWh/m ² /yr	% DFEE/TFEE	PASS		
Average TFEE = 27.68 kWh/m ² /yr	4.09 %			

Block Compliance Report - DPER				
Block Reference: MO 251024 Proposed	Block Name:			
Property-Assessment Reference	Floor area (m ²)	DPER (kWh/m ² /yr)	TPER (kWh/m ² /yr)	% DPER/TPER
00grd sample 1 Plot 01 - Block B 2B3P W	77.00	18.01	71.68	74.87 %
05flr sample 1 Plot 12 - Block B 1B2P	50.00	13.47	75.09	82.06 %
05flr sample 2 Plot 13 - Block C 1 2B4P	72.00	17.31	78.55	77.96 %
02flr sample 1 Plot 06 - Block C 2B4P	72.00	12.98	61.71	78.97 %
02flr sample 2 Plot 07 - Block C 2B4P	68.00	13.12	61.50	78.67 %
00grd sample 2 Plot 02 - Block C 3B5P D	96.00	19.58	48.50	59.63 %
02flr sample 3 Plot 08 - Block D 3B5P	86.00	12.55	58.59	78.58 %
05flr sample 3 Plot 14 - Block D 3B5P	86.00	16.84	70.26	76.03 %
00grd sample 4 Plot 04 - Block E 1B2P	50.00	14.88	82.69	82.01 %
02flr sample 5 Plot 10 - Block E 1B2P	50.00	11.74	66.17	82.26 %
05flr sample 5 Plot 16 - Block E 1B2P	50.00	11.74	66.17	82.26 %
07flr sample 2 Plot 20 - Block E 1B2P	50.00	12.16	63.25	80.77 %

Block Compliance

07flr sample 3 Plot 21 - Block E 1B2P	50.00	14.66	81.85	82.09 %
09flr sample 2 Plot 26 - Block E 1B2P	50.00	14.66	81.85	82.09 %
02flr sample 4 Plot 09 - Block E 2B4P	72.00	12.68	60.56	79.06 %
05flr sample 4 Plot 15 - Block E 2B4P	72.00	12.73	60.91	79.10 %
07flr sample 1 Plot 19 - Block E 2B4P	72.00	12.40	58.92	78.95 %
09flr sample 1 Plot 25 - Block E 2B4P	72.00	16.63	75.30	77.92 %
00grd sample 5 Plot 05 - Block E 3B4P W	97.00	17.40	67.07	74.06 %
00grd sample 3 Plot 03 - Block E 4B7P D	120.00	16.05	41.24	61.08 %
08flr sample 2 Plot 24 - Block F 1B2P	50.00	13.81	75.91	81.81 %
02flr sample 6 Plot 11 - Block F 3B5P	85.50	14.38	61.53	76.63 %
05flr sample 6 Plot 17 - Block F 3B5P	85.50	11.78	52.08	77.38 %
06flr sample 1 Plot 18 - Block F 3B5P	85.50	15.97	66.07	75.83 %
07flr sample 4 Plot 22 - Block F 3B5P	85.50	14.31	61.50	76.73 %
08flr sample 1 Plot 23 - Block F 3B5P	85.50	19.34	77.83	75.15 %
Totals:	1889.50	381.18	1726.78	
Average DPER = 14.94 kWh/m ² /yr	% DPER/TPER	PASS		
Average TPER = 64.74 kWh/m ² /yr	76.92 %			