

Energy Statement

Dye House, Prescott

Project number: 10136

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Contents

1	Executive Summary	3
2	Existing and Proposed Development	4
3	Planning Policy	4
4	Methodology	6
5	Baseline Energy & CO ₂	7
6	Low Carbon Design – Fabric First – Be Lean	8
7	Low Carbon Technology Review & Recommendations	9
8	Low Carbon Technology – Renewable Energy Generation - Be Green	13
9	Conclusion.....	14
10	Appendix 1	15

1 Executive Summary

This report has been produced by Base Energy on behalf of Group D Developments Ltd and in support of the planning application for the development named as Dye House, Prescott, comprising of 21 houses and 24 apartments across two blocks falling under the requirements of Knowsley Council and Part L building regulations

It sets out the design approach with regards to energy, carbon dioxide emissions, and sustainability in order to ensure the development complies with:

- National Planning Policy
- Knowsley Council Policy CS22

The above policies require:

- A high standard of sustainable design and construction
- Meet Part L 2021

The design of the development will incorporate energy efficient building fabric and services in addition to low carbon technology:

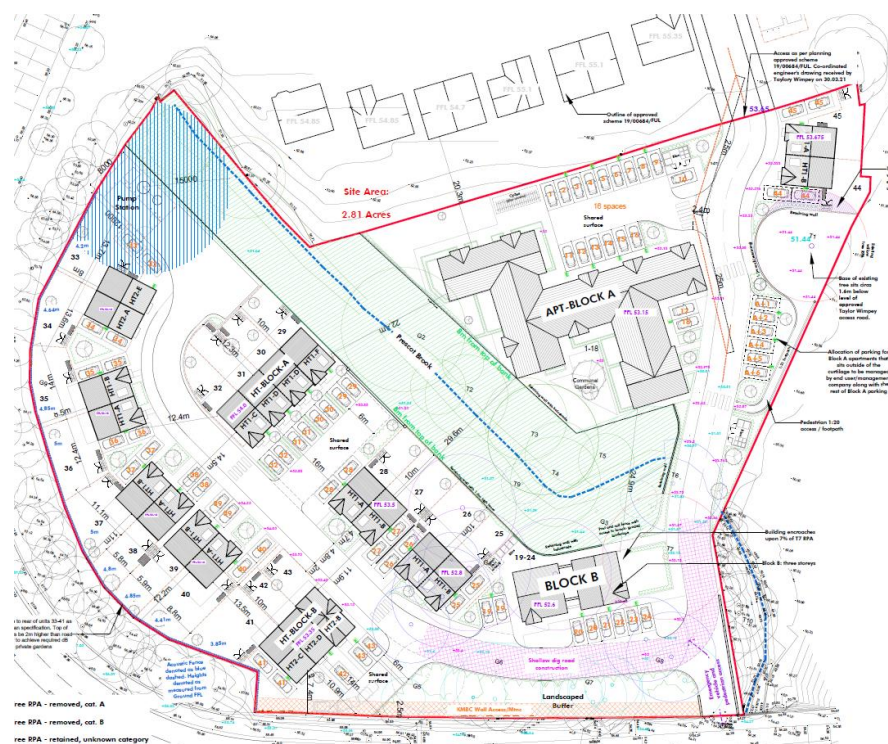
- Thermal specification meeting Part L 2021 notional U-values
- A design which limits air permeability, targeting
- A design which limits thermal bridging by incorporating
- Energy saving building services including low energy lighting and ventilation
- Low carbon Air Source Heat Pumps

This results in a 58% saving in CO2 emissions, 13% saving in Primary Energy and 4.5% saving in Fabric Energy.

2 Existing and Proposed Development

The site is located at Dye House, Liverpool Road, Prescot (Figure 1).

As previously detailed, proposals are for the construction of 21 houses consisting of terrace and semi-detached dwellings, with 16 three storey house types and 5 two storey house types. There are two blocks of flats with 18 apartments to Block A, and 6 apartments to block B.



The dwellings and apartments face in various orientations.

Given the scale and nature of the site, there are some constraints to the development proposals in terms of the layout, positioning and orientation of the proposed dwellings. Subsequently, these constraints will impact on the feasibility of low and zero carbon measures (as discussed in Section 4 of this report).

3 Planning Policy

National Planning Policy Framework 2021

The NPPF was updated in July 2021 to place greater emphasis on beauty, place-making, the environment, and sustainable development. The strengthened environmental objectives aim to protect and enhance the natural, built, and historic environment, and encourage effective land use, greater biodiversity, prudent use of natural resources, minimisation of waste and pollution, and adaptation to climate change alongside a move to a low carbon economy.

Local Planning

Knowsley Council Local Plan Core Strategy (Policy CS22: Sustainable and Low Carbon Development) states:

New developments will be required to meet high standards of sustainable design and construction and reduce carbon emissions. This should be achieved by Designing new buildings for flexible uses throughout their lifetime, Making the most effective and sustainable use of water, aggregates and other resources and Limiting energy use by incorporating high standards of insulation, heat retention, natural ventilation and passive solar techniques which has been applied to this project.

Government targets for carbon reduction in new development are expected to be implemented through updates to the Building Regulations.

Based on the above, there is not a specific percentage target the proposed dwellings will need to achieve. As such, this report demonstrates how the dwellings will meet current Building Regulation requirements for energy efficiency (baseline scenario) and, through an assessment of energy efficiency measures through a fabric first approach, how the dwellings could potentially achieve a greater saving in CO2 emissions.

This report has been prepared in line with Part L Building Regulations 2021.

4 Methodology

The Standard Assessment Procedure (SAP) is the UK Government methodology for assessing and calculating the energy performance of dwellings.

The Simplified Building Energy Model (SBEM) is the UK Government methodology for assessing and calculating the energy performance of non-domestic buildings.

SAP and SBEM calculations take into account a range of factors that contribute to energy efficiency, including:

- Materials used for the construction and the thermal insulation of the building fabric (u-values¹ and thermal mass)
- Air permeability
- Efficiency, fuel source, and control of heating and cooling systems
- Ventilation system energy use and heat recovery
- Lighting energy
- Low carbon and energy saving or generating technologies

Approved Document Part L of current Building Regulations addresses the conservation of fuel and power. Part L is divided into two separate documents:

- Part L1 Newly constructed and extended or renovated existing dwellings
- Part L2 Newly constructed and extended or renovated existing non-domestic buildings

To comply with Part L, the calculations should demonstrate how the building will either meet or achieve a percentage reduction in the Building Emission Rate (BER) under the required Target Emission Rate (TER).

The calculation software has been used to calculate a baseline of energy demand and carbon dioxide emissions as appropriate from which any reductions or contributions have been measured.

¹ U-values (Thermal Transmittance) - the measure of the overall rate of heat transfer by all mechanisms under standard conditions, through a particular section of a construction. Lower u-values mean better thermal insulation

5 Baseline Energy & CO2

Energy modelling software has been used to calculate a baseline for the development. This forms the basis from which compliance with planning policy has been measured.

Table 5.1: Baseline CO2

	CO2 Emission Rate (kg CO2/m2/year)	Total Baseline Emissions (kg CO2/year)
Baseline	12.94	43,041

The **Total Baseline CO2 Emissions** for the development are shown to be 43,041 kg/year.

6 Low Carbon Design – Fabric First – Be Lean

Before considering low carbon energy generating technology the development has been designed to reduce energy demand through the first step of the energy hierarchy by considering 'fabric first'. A thermally efficient building envelope will follow the design standards as set out below.

Table 6.0: Building Fabric Standards (including u-values W/m²K)

	Part L 2013 Limiting Parameters	Part L 2021 Limiting Parameters	Part L 2021 Notional Targets	Proposed Development
Walls	0.30	0.26	0.18	0.18
Ground Floor	0.25	0.18	0.13	0.11
Roof pitched	0.20	0.16	0.11	0.13
Roof ceiling	0.20	0.16	0.11	0.11
Windows	2.00	1.6	1.2	1.2 and 0.5 g-value
Doors	2.00	1.6	1.0	1.0
Air permeability	10.00	8.00	5.00	5.0

- **Insulation:** The specified building envelope is designed to meet the notional Part L targets and will help to limit the energy demand of the dwelling for space heating. Windows are to be BFRC or CERTAS rated with a proposed u-value of 1.2 and g-value of 0.5
- **Thermal bridging:** The design will seek to limit heat loss through thermal bridging targeting a global 'y-value' of 0.05, either Non-Government approved details to be used or bespoke PSI values to be calculated

Once heat retention has been addressed the next step is to ensure energy consuming building services are efficient.

- **Lighting:** Low energy LED lighting throughout with a minimum efficacy of 85 lumens per watt
- **Space & Water Heating:** Air Source Heat Pump
- **Heating Controls:** Comprising: Time & temperature zone control
- **Ventilation:** Continuous Mechanical ventilation

7 Low Carbon Technology Review & Recommendations

Having set out an energy efficient design, the next step is to incorporate low carbon technology for energy generation. A number of technologies exist and should be specified where they:

- compliance with planning policy
- are feasible for the site
- are cost efficient
- are appropriate for proposed development form and function
- protect against fuel poverty
- promote fuel security
- reduce reliance on fossil fuels
- reduce carbon emissions
- reduce resource depletion
- reduce pollution

Site location and development form and function will influence the suitability of different technologies through:

- Orientation
- Space (inside and outside of the buildings)
- Surrounding topography, structures, and natural features
- Wind speed
- Overshading
- Geology and ground conditions
- Building form, function, and density

In determining the most feasible renewable technologies for the dwelling, the following have been reviewed:

- Wind turbines
- Ground Source Heat Pumps
- Air Source Heat Pumps
- Biomass
- Combined Heat and Power
- Photovoltaic Panels
- Solar water heating

WIND TURBINES

Wind turbines are used to produce electricity. They can be either pole mounted (in a suitably exposed position) or building mounted; building mounted systems need a sufficient wind speed at the structural height and both a structural survey and planning permission.

- Wind speed can be too low on low rise buildings
- Taller systems need sufficient space
- Wind resources very variable and unpredictable
- May need planning permission

Wind turbines technology is **not recommended** for this development

GROUND SOURCE HEAT PUMP (GSHP)

GSHPs use naturally occurring underground low-level heat in areas with appropriate geological features. Heat is transferred from the ground by either extracting and discharging (re-charging) water from/to the ground directly (open loop) or circulating water through pipes buried within the ground, (closed loop). The water is passed through a heat pump to transfer the heat from this water into a higher temperature water circuit to provide heating. The loop can be fitted horizontally (laid in a shallow trench) or vertically (in a borehole).

- Feasibility analysis is costly
- Suitable ground conditions required
- More capital intensive than air source heat pumps
- Can be more efficient and lower running costs than ASHPs
- Well suited to highly insulated buildings

Ground source heat pump technology is **not recommended** for this development

AIR SOURCE HEAT PUMP (ASHP)

ASHP systems absorb heat from outside air at a low temperature into a fluid which is then passed through an electrically driven compressor where its temperature is increased. There are two main types of ASHP systems: Air to Water systems distribute heat through wet central heating; Air to air produce warm air which is circulated by fans. For an ASHP system to be installed, there needs to be ample outdoor space for the external condensing unit; these units can also be noisy and blow out colder air to the neighbouring environment.

- Requires space for external plant and internal hot water tank for wet systems supplying DHW
- Can generate noise though quieter systems have been developed
- Least efficient when most needed
- Longer life than fossil fuel boilers
- High capital costs vs gas systems but lower than GSHPs
- Well suited to highly insulated buildings

Air source heat pump technology **is recommended** for this development, however this should be checked with an installer as due to some plots being terrace dwellings

BIOMASS

Biomass systems burn wood pellets, chips, or logs to provide heat in a single room, or to power central heating and hot water boilers. There needs to be ample space available for both the boiler and the storage of fuel. There will also be regular deliveries of fuel and therefore adequate site access is required.

- Carbon emissions are cyclical unlike fossil fuel
- Requires fuel storage space and bulk delivery
- Carbon 'neutral' fuel in isolation but supply side emissions are still present so not neutral overall
- Harmful particulate emissions impact air quality and health

Biomass technology **is not recommended** for this development

COMBINED HEAT AND POWER (CHP)

CHP is effectively an on-site small power plant providing both electrical power and thermal heat energy. It is an energy efficiency and low carbon measure rather than a renewable energy technology. A CHP system operates by burning a primary fuel (normally natural gas) by use of either a reciprocating engine or turbine, which in turn drives an alternator to generate electrical power. The heat emitted by the engine and exhaust gases is recovered and used to heat the building or to provide hot water.

- Reduces consumption of and reliance on grid electricity
- Works best with high and consistent heat and hot water demand
- Recovers waste energy
- Can export to the grid
- Uses fossil fuel
- Emissions on site rather than upstream
- Efficiency is sensitive to sizing

CHP **is not recommended** for this development

DISTRICT HEATING

District Heating systems provide multiple buildings or dwellings with heat and hot water from a central boiler house, or 'energy centre'. The system can provide heating or cooling which is transferred from the energy centre through a network of highly insulated pipes carrying the heated water to each dwelling.

- Economies of scale
- Frees up space in habitable areas of development
- Variety of systems
- Can make use of waste heat from industry
- Can be fossil fuel based and dependent

There are no known district heating networks in the area.

SOLAR PHOTOVOLTAIC (PV)

Solar PV cells (which are mounted together in panels or tiles on the roof) convert sunlight into electricity. The cells are made from layers of semi-conducting material; when the light shines on the cell, an electric field is created across the layers. Although PV cells are most effective in bright sunlight, they can still generate electricity on a cloudy day. The power of a PV cell is measured in kilowatts peak (kWp). Each PV panel produces 0.25Watts to 0.35Watts depending on the manufacture.

- Passive technology, requires no energy input from grid
- Does not require sunny days to generate power
- Capital costs can be high although payback is effective
- Needs sufficient roof space and orientation
- Zero site or upstream emissions
- Can export to the grid

Solar PV technology **is recommended** for this development, however only for certain plots which have suitable south facing roofs. There are plots which do not have suitable south facing roof space. Therefore ASHPs are being recommended to help comply with Part L.

SOLAR HOT WATER

Solar hot water systems absorb energy from the sun and transfer this energy using heat exchangers to heat water which can then be stored. Systems should be roof mounted and oriented to face between a south-east and south-west direction.

- Mostly passive technology but requires pump energy
- Not suitable for combi boilers and developments without roof space
- Lower CO2 reductions than other technologies

Solar hot water technology **is not recommended** for this development

Low Carbon Technology Summary

The low carbon technology review indicates that there are not many feasible technologies for the development. We have reviewed ASHP's further in the energy assessments as potentially being feasible. The following low carbon technology is recommended:

Air Source Heat Pumps

This technology is deemed optimal for meeting the needs of the development and achieving policy compliance. It has been incorporated into the energy model and the results are presented in the next section.

8 Low Carbon Technology – Renewable Energy Generation - Be Green

The selected Low Carbon Technology has been incorporated into the calculation and the results are set out below.

Table 8.1: Baseline vs Be Lean CO2

	CO2 Emission Rate (kg CO2/m2/year)	Total Baseline Emissions (kg CO2/year)	Reduction in CO2
Baseline	12.94	43,041	N/A
Be Green Design	5.48	18,215	58%

The **CO2 Emissions reduction** as a result of energy efficient fabric and services is shown to be 000 kg/year.

Table 8.2: Baseline vs Be Lean Energy Demand

	Energy Demand (kWh/m2/year)	Reduction in Energy Demand
Baseline	66.33	N/A
Lean & Green Design	57.65	13%

The **Energy Demand reduction** as a result of energy efficient fabric and services is shown to be 000 kWh per year

Table 8.3: Baseline Results – SAP 10 for carbon reporting spreadsheet

SAP 10	CO2 Emission Rate (kg CO2/m2/year)	Reduction in CO2 Using SAP 10 Factors
Baseline	37.7	N/A
Lean & Green Design	36.0	4.6%

The **Total Baseline CO2 Emissions** when calculated in **SAP 10** are shown to be 000 kg/year.

9 Conclusion

Proposals are for the development named as Dye House, comprising of 21 houses and 24 apartments across two blocks falling under the requirements of Knowsley Council and Part L building regulations.

Under the local planning Policy CS22 the proposed development is required to show high standards of sustainable design and construction while requiring to meet the new Part L 2021 building regulations.

Energy modelling software has been used to calculate a baseline against which compliance with the above can be measured.

The proposed development will be designed to limit energy demand through the inclusion of a thermally efficient building fabric and energy efficient services.

Low carbon technology will be incorporated and is to comprise ASHP.

This results in a 58% saving in CO₂, 13% saving in Primary Energy and 4% saving in fabric energy.

This Energy Statement and the calculations on which it is based demonstrate that the proposed development complies with the local planning policy requirements.

10 Appendix 1

Full SAP Calculation Printout



Property Reference	S10136 1A	Issued on Date	12/07/2023
Assessment Reference	001	Prop Type Ref	
Property	DYE House, Prescot		
SAP Rating	79 C	DER	4.85
Environmental	96 A	TER	12.35
CO ₂ Emissions (t/year)	0.41	% DER < TER	60.73
Compliance Check	See BREL	DFEE	40.76
% DPER < TPER	21.05	TREE	41.46
		% DFEE < TFE	1.68
		DPER	51.09
		TPER	64.71
Assessor Details	Mr. Peter Kinsella	Assessor ID	L770-0002
Client	G Group, Patrick Raft		

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)
Ground floor	38.0300 (1b)	x 2.4900 (2b)	= 94.6947 (1b) -
First floor	38.0300 (1c)	x 2.7300 (2c)	= 103.8219 (1c) -
Second floor	16.8900 (1d)	x 3.2100 (2d)	= 54.2169 (1d) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	92.9500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 252.7335 (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	1 * 10 = 10.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

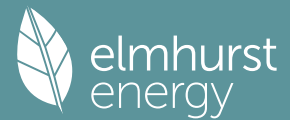
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 10.0000 / (5) = 0.0396 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.2396 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2216 (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	0.2825	0.2770	0.2715	0.2438	0.2382	0.2105	0.2105	0.2050	0.2216	0.2382	0.2493	0.2604 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
Effective ac	0.5325	0.5270	0.5215	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5104 (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
Door			3.3200	1.0000	3.3200		(26)
Windows (Uw = 1.20)			15.7100	1.1450	17.9885		(27)

Full SAP Calculation Printout



Heat Loss Floor 1				38.0300	0.1100	4.1833	(28a)
External Wall 1	109.8900	18.0100		91.8800	0.1800	16.5384	(29a)
Dormer wall	8.5500	1.0200		7.5300	0.1800	1.3554	(29a)
Stud wall	15.8900			15.8900	0.1300	2.0657	(29a)
Ceiling joists	36.7700			36.7700	0.0800	2.9416	(30)
Pitched roof	53.4900			53.4900	0.1300	6.9537	(30)
Dormer roof	1.3400			1.3400	0.1100	0.1474	(30)
Total net area of external elements Aum(A, m2)				263.9600			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =		55.4940	(33)
Party Wall 1				58.2700	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							13.1980 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	68.6920 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	44.4149	43.9529	43.4908	41.7010	41.7010	41.7010	41.7010	41.7010	41.7010	41.7010	41.7010	42.5667	(38)
Average = Sum(39)m / 12 =	113.1070	112.6449	112.1829	110.3931	110.3931	110.3931	110.3931	110.3931	110.3931	110.3931	110.3931	111.2588	(39)
												111.0282	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.2169	1.2119	1.2069	1.1877	1.1877	1.1877	1.1877	1.1877	1.1877	1.1877	1.1877	1.1970	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

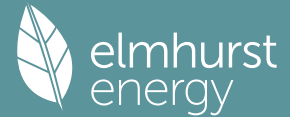
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6640 (42)
Hot water usage for mixer showers	94.7183	93.2949	91.2206	87.2520	84.3232	81.0571	79.2006	81.2592	83.5157	87.0225	91.0764	94.3554	(42a)
Hot water usage for baths	29.7465	29.3047	28.6826	27.5355	26.6766	25.7242	25.2098	25.8275	26.5002	27.5193	28.6899	29.6459	(42b)
Hot water usage for other uses	41.9119	40.3878	38.8637	37.3397	35.8156	34.2915	34.2915	35.8156	37.3397	38.8637	40.3878	41.9119	(42c)
Average daily hot water use (litres/day)												153.0084	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	166.3766	162.9873	158.7669	152.1272	146.8154	141.0728	138.7019	142.9023	147.3555	153.4055	160.1541	165.9131	(44)
Energy content (annual)	263.4999	232.0918	244.0189	208.2545	197.6418	173.4655	167.7480	176.9429	181.7041	208.1698	228.1689	259.7799	(45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m =	2541.4858
Water storage loss:	39.5250	34.8138	36.6028	31.2382	29.6463	26.0198	25.1622	26.5414	27.2556	31.2255	34.2253	38.9670	(46)
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8900	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0206	(55)
Total storage loss	31.6386	28.5768	31.6386	30.6180	31.6386	30.6180	31.6386	31.6386	30.6180	31.6386	30.6180	31.6386	(56)
If cylinder contains dedicated solar storage	31.6386	28.5768	31.6386	30.6180	31.6386	30.6180	31.6386	31.6386	30.6180	31.6386	30.6180	31.6386	(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	318.4009	281.6798	298.9199	261.3845	252.5428	226.5955	222.6490	231.8439	234.8341	263.0708	281.2989	314.6809	(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	318.4009	281.6798	298.9199	261.3845	252.5428	226.5955	222.6490	231.8439	234.8341	263.0708	281.2989	314.6809	(64)
Total per year (kWh/year)												3187.9008	(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	131.5345	116.8409	125.0571	111.7486	109.6367	100.1813	99.6970	102.7543	102.9206	113.1373	118.3702	130.2976	(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	133.1992	133.1992	133.1992	133.1992	133.1992	133.1992	133.1992	133.1992	133.1992	133.1992	133.1992	133.1992	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	127.2733	140.9097	127.2733	131.5157	127.2733	131.5157	127.2733	127.2733	131.5157	127.2733	131.5157	127.2733	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	244.4015	246.9376	240.5467	226.9411	209.7665	193.6248	182.8412	180.3051	186.6960	200.3016	217.4762	233.6179	(68)
Pumps, fans	36.3199	36.3199	36.3199	36.3199	36.3199	36.3199	36.3199	36.3199	36.3199	36.3199	36.3199	36.3199	(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)	-106.5594	-106.5594	-106.5594	-106.5594	-106.5594	-106.5594	-106.5594	-106.5594	-106.5594	-106.5594	-106.5594	-106.5594	(71)

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Total internal gains	176.7937	173.8704	168.0875	155.2064	147.3611	139.1407	134.0013	138.1106	142.9453	152.0662	164.4030	175.1312 (72)
	611.4282	624.6775	598.8672	576.6230	547.3607	527.2410	507.0755	508.6487	524.1168	542.6008	576.3546	598.9821 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
North	5.4100	10.6334	0.5000	0.0000		0.7700	22.1478 (74)
South	10.3000	46.7521	0.5000	0.0000		0.7700	185.3953 (78)

Solar gains	207.5431	345.9553	458.6918	552.6587	611.1429	604.9748	583.8614	539.3605	490.5002	377.8762	247.0788	178.6621 (83)
Total gains	818.9713	970.6327	1057.5590	1129.2817	1158.5036	1132.2158	1090.9369	1048.0092	1014.6169	920.4770	823.4334	777.6442 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	57.0686	57.3027	57.5387	58.4716	58.4716	58.4716	58.4716	58.4716	58.4716	58.4716	58.4716	58.0166	
alpha	4.8046	4.8202	4.8359	4.8981	4.8981	4.8981	4.8981	4.8981	4.8981	4.8981	4.8981	4.8678	
util living area	0.9897	0.9765	0.9525	0.8920	0.7767	0.5992	0.4405	0.4773	0.6944	0.9078	0.9775	0.9918 (86)	
Living	20.0141	20.1953	20.4058	20.6546	20.8278	20.9126	20.9323	20.9302	20.8877	20.6683	20.3100	19.9948	
Non living	18.7741	19.0051	19.2690	19.5773	19.7625	19.8359	19.8475	19.8466	19.8188	19.5997	19.1674	18.7623	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.4956	20.1953	20.4058	20.6546	20.8278	20.9126	20.9323	20.9302	20.8877	20.6683	20.3100	20.1354 (87)	
Th 2	19.9065	19.9105	19.9145	19.9299	19.9299	19.9299	19.9299	19.9299	19.9299	19.9299	19.9299	19.9224 (88)	
util rest of house	0.9865	0.9695	0.9381	0.8601	0.7167	0.5093	0.3359	0.3700	0.6075	0.8735	0.9694	0.9892 (89)	
MIT 2	19.4551	19.0051	19.2690	19.5773	19.7625	19.8359	19.8475	19.8466	19.8188	19.5997	19.1674	18.9713 (90)	
Living area fraction									fLA = Living area / (4) =				0.3258 (91)
MIT	19.7941	19.3928	19.6394	19.9282	20.1095	20.1866	20.2009	20.1996	20.1670	19.9478	19.5396	19.3506 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.7941	19.3928	19.6394	19.9282	20.1095	20.1866	20.2009	20.1996	20.1670	19.9478	19.5396	19.3506 (93)	

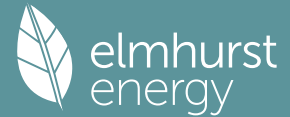
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9861	0.9652	0.9337	0.8601	0.7276	0.5317	0.3627	0.3975	0.6280	0.8742	0.9656	0.9874 (94)
Useful gains	807.5517	936.8932	987.4789	971.2691	842.8705	601.9920	395.7079	416.6032	637.1788	804.6600	795.1239	767.8430 (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	1752.4850	1632.5414	1474.0116	1217.4389	928.3532	616.7260	397.5113	419.4525	669.7559	1031.9365	1373.2465	1685.6324 (97)
Space heating kWh	703.0304	467.4756	361.9803	177.2423	63.5991	0.0000	0.0000	0.0000	0.0000	169.0937	416.2482	682.8352 (98a)
Space heating requirement - total per year (kWh/year)												3041.5048
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	703.0304	467.4756	361.9803	177.2423	63.5991	0.0000	0.0000	0.0000	0.0000	169.0937	416.2482	682.8352 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3041.5048
Space heating per m2										(98c) / (4) =		32.7219 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												301.7564 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	703.0304	467.4756	361.9803	177.2423	63.5991	0.0000	0.0000	0.0000	0.0000	169.0937	416.2482	682.8352 (98)
Space heating efficiency (main heating system 1)	301.7564	301.7564	301.7564	301.7564	301.7564	0.0000	0.0000	0.0000	0.0000	301.7564	301.7564	301.7564 (210)
Space heating fuel (main heating system)	232.9794	154.9182	119.9578	58.7369	21.0763	0.0000	0.0000	0.0000	0.0000	56.0365	137.9418	226.2869 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)												

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	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 (215)
Water heating													
Water heating requirement	318.4009	281.6798	298.9199	261.3845	252.5428	226.5955	222.6490	231.8439	234.8341	263.0708	281.2989	314.6809	(64)
Efficiency of water heater													
(217)m	177.2523	177.2523	177.2523	177.2523	177.2523	177.2523	177.2523	177.2523	177.2523	177.2523	177.2523	177.2523	(216)
Fuel for water heating, kWh/month	179.6314	158.9146	168.6409	147.4646	142.4764	127.8378	125.6113	130.7988	132.4857	148.4160	158.6997	177.5327	(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	2.4092	2.1761	2.4092	2.3315	2.4092	2.3315	2.4092	2.4092	2.3315	2.4092	2.3315	2.4092	(231)
Lighting	30.5225	24.4863	22.0472	16.1527	12.4768	10.1937	11.3818	14.7945	19.2165	25.2131	28.4782	31.3708	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1007.9337	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												177.2523	
Water heating fuel used												1798.5098	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.4720, total flow = 16.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												28.3668	(230a)
Total electricity for the above, kWh/year												28.3668	(231)
Electricity for lighting (calculated in Appendix L)												246.3340	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												3081.1444	(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	1007.9337	0.1564	157.6325 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1798.5098	0.1410	253.5848 (264)
Space and water heating			411.2173 (265)
Pumps, fans and electric keep-hot	28.3668	0.1387	3.9348 (267)
Energy for lighting	246.3340	0.1443	35.5536 (268)
Total CO2, kg/year			450.7057 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.8500 (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	1007.9337	1.5789	1591.4757 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1798.5098	1.5214	2736.1835 (278)
Space and water heating			4327.6592 (279)
Pumps, fans and electric keep-hot	28.3668	1.5128	42.9133 (281)
Energy for lighting	246.3340	1.5338	377.8354 (282)
Total Primary energy kWh/year			4748.4079 (286)
Dwelling Primary energy Rate (DPER)			51.0900 (287)

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1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	38.0300 (1b)	x 2.4900 (2b)	= 94.6947 (1b) -
First floor	38.0300 (1c)	x 2.7300 (2c)	= 103.8219 (1c) -
Second floor	16.8900 (1d)	x 3.2100 (2d)	= 54.2169 (1d) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	92.9500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 252.7335 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 30.0000 / (5) = 0.1187 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3687 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3410 (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	0.4348	0.4263	0.4178	0.3752	0.3666	0.3240	0.3240	0.3155	0.3410	0.3666	0.3837	0.4007 (22b)
Effective ac	0.5945	0.5909	0.5873	0.5704	0.5672	0.5525	0.5525	0.5498	0.5582	0.5672	0.5736	0.5803 (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
TER Opaque door			3.3200	1.0000	3.3200		(26)
TER Opening Type (Uw = 1.20)			15.7100	1.1450	17.9885		(27)
Heat Loss Floor 1			38.0300	0.1300	4.9439		(28a)
External Wall 1	109.8900	18.0100	91.8800	0.1800	16.5384		(29a)
Dormer wall	8.5500	1.0200	7.5300	0.1800	1.3554		(29a)
Stud wall	15.8900		15.8900	0.1800	2.8602		(29a)
Ceiling joists	36.7700		36.7700	0.1100	4.0447		(30)
Pitched roof	53.4900		53.4900	0.1100	5.8839		(30)
Dormer roof	1.3400		1.3400	0.1100	0.1474		(30)
Total net area of external elements Aum(A, m ²)			263.9600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	57.0824		(33)
Party Wall 1			58.2700	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 250.0000 (35)

List of Thermal Bridges

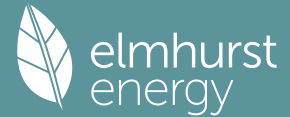
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.6500	0.0500	0.5325
E3 Sill	10.6500	0.0500	0.5325
E4 Jamb	29.1600	0.0500	1.4580
E5 Ground floor (normal)	17.1500	0.1600	2.7440
E6 Intermediate floor within a dwelling	17.1500	0.0000	0.0000
E16 Corner (normal)	10.4400	0.0900	0.9396
E18 Party wall between dwellings	10.4400	0.0600	0.6264
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			6.8330 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 63.9154 (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	49.5860	49.2798	48.9797	47.5701	47.3063	46.0786	46.0786	45.8512	46.5515	47.3063	47.8399	48.3977 (38)
Heat transfer coeff	113.5015	113.1953	112.8952	111.4855	111.2218	109.9940	109.9940	109.7666	110.4669	111.2218	111.7553	112.3131 (39)
Average = Sum(39)m / 12 =												111.4843

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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HLP	1.2211	1.2178	1.2146	1.1994	1.1966	1.1834	1.1834	1.1809	1.1885	1.1966	1.2023	1.2083 (40)
HLP (average)												1.1994
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6640 (42)
Hot water usage for mixer showers	68.8860	67.8508	66.3423	63.4560	61.3260	58.9506	57.6005	59.0976	60.7387	63.2891	66.2374	68.6221 (42a)
Hot water usage for baths	29.7465	29.3047	28.6826	27.5355	26.6766	25.7242	25.2098	25.8275	26.5002	27.5193	28.6899	29.6459 (42b)
Hot water usage for other uses	41.9119	40.3878	38.8637	37.3397	35.8156	34.2915	34.2915	35.8156	37.3397	38.8637	40.3878	41.9119 (42c)
Average daily hot water use (litres/day)												129.1920 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	140.5444	137.5433	133.8886	128.3312	123.8182	118.9664	117.1018	120.7407	124.5785	129.6721	135.3151	140.1799 (44)
Distribution loss (46)m = 0.15 x (45)m	22.5879	195.8598	205.7818	175.6789	166.6831	146.2830	141.6244	149.5022	153.6177	175.9638	192.7812	219.4878 (45)
Water storage loss:	33.3882	29.3790	30.8673	26.3518	25.0025	21.9425	21.2437	22.4253	23.0427	26.3946	28.9172	32.9232 (46)
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	269.1828	237.9455	252.3767	220.7708	213.2780	191.3748	188.2193	196.0971	198.7096	222.5587	237.8730	266.0827 (62)
WWHRS	-31.4918	-27.8516	-29.1646	-24.1494	-22.5064	-19.2589	-18.0522	-19.1967	-19.9260	-23.4906	-26.6120	-30.9086 (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	237.6910	210.0939	223.2121	196.6213	190.7715	172.1159	170.1672	176.9004	178.7836	199.0681	211.2611	235.1741 (64)
Total per year (kWh/year)												2401.8603 (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	111.2864	98.7920	105.6984	94.4867	92.6980	84.7126	84.3660	86.9854	87.1514	95.7839	100.1732	110.2556 (65)

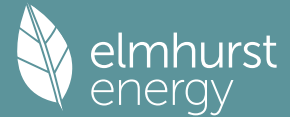
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	133.1992	133.1992	133.1992	133.1992	133.1992	133.1992	133.1992	133.1992	133.1992	133.1992	133.1992	133.1992 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	127.2733	140.9097	127.2733	131.5157	127.2733	131.5157	127.2733	127.2733	131.5157	127.2733	131.5157	127.2733 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	244.4015	246.9376	240.5467	226.9411	209.7665	193.6248	182.8412	180.3051	186.6960	200.3016	217.4762	233.6179 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3199	36.3199	36.3199	36.3199	36.3199	36.3199	36.3199	36.3199	36.3199	36.3199	36.3199	36.3199 (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)	-106.5594	-106.5594	-106.5594	-106.5594	-106.5594	-106.5594	-106.5594	-106.5594	-106.5594	-106.5594	-106.5594	-106.5594 (71)
Water heating gains (Table 5)	149.5785	147.0118	142.0677	131.2316	124.5941	117.6564	113.3952	116.9159	121.0436	128.7418	139.1295	148.1930 (72)
Total internal gains	587.2130	600.8189	575.8474	555.6481	527.5937	505.7566	486.4694	487.4539	502.2150	522.2764	554.0811	575.0439 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				5.4100	10.6334	0.6300	0.7000	0.7700	17.5809 (74)			
South				10.3000	46.7521	0.6300	0.7000	0.7700	147.1668 (78)			
Solar gains	164.7477	274.6193	364.1096	438.7005	485.1252	480.2290	463.4691	428.1444	389.3591	299.9581	196.1311	141.8220 (83)
Total gains	751.9607	875.4382	939.9569	994.3486	1012.7189	985.9856	949.9386	915.5983	891.5741	822.2345	750.2122	716.8659 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n _{l,m} (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	56.8703	57.0241	57.1757	57.8987	58.0359	58.6838	58.6838	58.8053	58.4325	58.0359	57.7589	57.4720
alpha	4.7914	4.8016	4.8117	4.8599	4.8691	4.9123	4.9123	4.9204	4.8955	4.8691	4.8506	4.8315
util living area	0.9928	0.9844	0.9693	0.9283	0.8383	0.6688	0.5002	0.5378	0.7594	0.9366	0.9846	0.9942 (86)
MIT	19.6919	19.9056	20.1726	20.5132	20.7879	20.9489	20.9899	20.9857	20.9025	20.5579	20.0693	19.6601 (87)
Th 2	19.9032	19.9058	19.9084	19.9205	19.9227	19.9333	19.9333	19.9353	19.9292	19.9227	19.9181	19.9134 (88)
util rest of house	0.9904	0.9795	0.9592	0.9040	0.7847	0.5753	0.3838	0.4202	0.6744	0.9100	0.9789	0.9923 (89)
MIT 2	18.4039	18.6762	19.0130	19.4369	19.7469	19.9047	19.9302	19.9304	19.8666	19.4992	18.8947	18.3708 (90)
Living area fraction									f _{LA} = Living area / (4) =			0.3258 (91)
MIT	18.8235	19.0767	19.3907	19.7875	20.0860	20.2449	20.2754	20.2742	20.2041	19.8441	19.2774	18.7908 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8235	19.0767	19.3907	19.7875	20.0860	20.2449	20.2754	20.2742	20.2041	19.8441	19.2774	18.7908 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9872	0.9745	0.9531	0.9005	0.7938	0.6040	0.4219	0.4587	0.6981	0.9077	0.9742	0.9896 (94)
Useful gains	742.3439	853.0946	895.8575	895.3847	803.8640	595.5472	400.7592	419.9698	622.4405	746.3165	730.8855	709.3795 (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	1648.4380	1604.7367	1455.2999	1213.7990	932.7100	620.9045	404.2762	425.2588	674.2978	1028.1414	1360.8847	1638.7368 (97)
Space heating kWh	674.1340	505.1035	416.2252	229.2583	95.8614	0.0000	0.0000	0.0000	0.0000	209.6778	453.5994	691.4418 (98a)
Space heating requirement - total per year (kWh/year)												3275.3014
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	674.1340	505.1035	416.2252	229.2583	95.8614	0.0000	0.0000	0.0000	0.0000	209.6778	453.5994	691.4418 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3275.3014
Space heating per m ²										(98c) / (4) =		35.2372 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	674.1340	505.1035	416.2252	229.2583	95.8614	0.0000	0.0000	0.0000	0.0000	209.6778	453.5994	691.4418 (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)	730.3727	547.2411	450.9482	248.3839	103.8585	0.0000	0.0000	0.0000	0.0000	227.1698	491.4403	749.1244 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	237.6910	210.0939	223.2121	196.6213	190.7715	172.1159	170.1672	176.9004	178.7836	199.0681	211.2611	235.1741 (64)
Efficiency of water heater (217)m	86.2639	85.9524	85.4364	84.4051	82.5998	79.8000	79.8000	79.8000	79.8000	84.1764	85.7278	79.8000 (216)
Fuel for water heating, kWh/month	275.5394	244.4306	261.2610	232.9497	230.9589	215.6841	213.2421	221.6798	224.0396	236.4892	246.4324	272.4163 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	26.4449	21.2151	19.1018	13.9948	10.8100	8.8319	9.8612	12.8180	16.6493	21.8448	24.6737	27.1799 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-36.6529	-52.2360	-75.8847	-86.2472	-93.7649	-87.7663	-86.6575	-81.4230	-72.3266	-60.1254	-40.4850	-31.6209 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-19.0306	-40.2166	-80.2814	-121.0935	-160.6309	-161.6091	-159.7346	-135.0355	-98.6786	-57.7173	-25.4726	-15.0374 (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)

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Annual totals kWh/year		
Space heating fuel - main system 1	3548.5389	(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	2875.1231	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	213.4252	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1879.7280	(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	4843.3592	(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	3548.5389	0.2100	745.1932 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2875.1231	0.2100	603.7758 (264)
Space and water heating			1348.9690 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	213.4252	0.1443	30.8039 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-805.1902	0.1344	-108.1915
PV Unit electricity exported	-1074.5378	0.1258	-135.1404
Total			-243.3319 (269)
Total CO2, kg/year			1148.3703 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.3500 (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	3548.5389	1.1300	4009.8490 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2875.1231	1.1300	3248.8891 (278)
Space and water heating			7258.7381 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	213.4252	1.5338	327.3588 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-805.1902	1.4966	-1205.0378
PV Unit electricity exported	-1074.5378	0.4616	-496.0512
Total			-1701.0890 (283)
Total Primary energy kWh/year			6015.1086 (286)
Target Primary Energy Rate (TPER)			64.7100 (287)

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Property Reference	S10136 TF Block A				Issued on Date	12/07/2023
Assessment Reference	v0		Prop Type Ref			
Property	Top floor Block A, Dye House, Liverpool					
SAP Rating	78 C	DER	5.72	TER	11.31	
Environmental	95 A	% DER < TER				49.43
CO ₂ Emissions (t/year)	0.36	DFEE	30.55	TFEE	33.55	
Compliance Check	See BREL	% DFEE < TFEE				8.95
% DPER < TPER	-0.01	DPER	59.29	TPER	59.28	
Assessor Details	Mr. Peter Kinsella				Assessor ID	L770-0002
Client	G Group, Patrick Raft					

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)
Ground floor	4.9900 (1b)	x 2.5600 (2b)	= 12.7744 (1b) -
First floor	69.5500 (1c)	x 2.8600 (2c)	= 198.9130 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.5400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	211.6874 (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	1 * 10 = 10.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

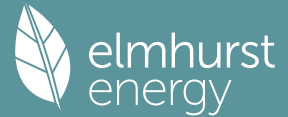
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 10.0000 / (5) = 0.0472 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.2472 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2287 (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	0.2916	0.2859	0.2802	0.2516	0.2458	0.2173	0.2173	0.2115	0.2287	0.2458	0.2573	0.2687 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5416	0.5359	0.5302	0.5016	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5073	0.5187 (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
Door			1.8900	1.4000	2.6460		(26)
Window (Uw = 1.20)			5.6900	1.1450	6.5153		(27)
Heat Loss Floor 1			4.9900	0.1300	0.6487	110.0000	548.9000 (28a)

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External Wall 1	22.1738	7.5800	14.5938	0.1800	2.6269	110.0000	1605.3180 (29a)
Corridor wall	25.0400		25.0400	0.1800	4.5072	110.0000	2754.4000 (29a)
External Roof 1	69.5500		69.5500	0.1100	7.6505	9.0000	625.9500 (30)
Total net area of external elements Aum(A, m2)			121.7538				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	24.5946			(33)
Party Wall 1			81.6700	0.0000	0.0000	20.0000	1633.4000 (32)
Party Floor 1			64.5600			30.0000	1936.8000 (32d)
Party Ceilings 1			60.3800			20.0000	1207.6000 (32b)
Internal Ceiling 1			4.9900			9.0000	44.9100 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10357.2780 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		138.9493 (35)
Thermal bridges (User defined value 0.050 * total exposed area)		6.0877 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.6822 (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	37.8336	37.4342	37.0348	35.0378	34.9284	34.9284	34.9284	34.9284	34.9284	34.9284	35.4372	36.2360 (38)
Average = Sum(39)m / 12 =	68.5159	68.1165	67.7171	65.7201	65.6107	65.6107	65.6107	65.6107	65.6107	65.6107	66.1195	66.9183 (39)
	68.5159	68.1165	67.7171	65.7201	65.6107	65.6107	65.6107	65.6107	65.6107	65.6107	66.1195	66.9183 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9192	0.9138	0.9085	0.8817	0.8802	0.8802	0.8802	0.8802	0.8802	0.8802	0.8870	0.8977 (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												2.3511 (42)
Hot water usage for mixer showers												
Hot water usage for baths	87.5053	86.1903	84.2740	80.6076	77.9019	74.8845	73.1694	75.0711	77.1558	80.3956	84.1408	87.1701 (42a)
Hot water usage for other uses	27.4906	27.0823	26.5074	25.4473	24.6536	23.7734	23.2980	23.8689	24.4905	25.4323	26.5142	27.3977 (42b)
Average daily hot water use (litres/day)	38.7078	37.3003	35.8927	34.4852	33.0776	31.6700	31.6700	33.0776	34.4852	35.8927	37.3003	38.7078 (42c)
	38.7078	37.3003	35.8927	34.4852	33.0776	31.6700	31.6700	33.0776	34.4852	35.8927	37.3003	141.3541 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	153.7038	150.5729	146.6742	140.5401	135.6330	130.3279	128.1374	132.0176	136.1315	141.7206	147.9553	153.2756 (44)
Energy content (annual)	243.4292	214.4138	225.4327	192.3924	182.5881	160.2534	154.9711	163.4654	167.8637	192.3136	210.7894	239.9925 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 2347.9053
Water storage loss:	36.5144	32.1621	33.8149	28.8589	27.3882	24.0380	23.2457	24.5198	25.1796	28.8470	31.6184	35.9989 (46)
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	270.3806	238.7570	252.3841	218.4744	209.5395	186.3354	181.9225	190.4168	193.9457	219.2650	236.8714	266.9439 (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	270.3806	238.7570	252.3841	218.4744	209.5395	186.3354	181.9225	190.4168	193.9457	219.2650	236.8714	266.9439 (64)
12Total per year (kWh/year)												Total per year (kWh/year) = Sum(64)m = 2665.2363 (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	80.9402	71.2926	74.9564	63.9705	60.7106	53.2842	51.5279	54.3522	55.8147	63.9443	70.0875	79.7975 (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	117.5561	117.5561	117.5561	117.5561	117.5561	117.5561	117.5561	117.5561	117.5561	117.5561	117.5561	117.5561 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	127.5197	141.1825	127.5197	131.7703	127.5197	131.7703	127.5197	127.5197	131.7703	127.5197	131.7703	127.5197 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	207.6533	209.8081	204.3781	192.8183	178.2260	164.5114	155.3492	153.1944	158.6244	170.1842	184.7765	198.4911 (68)
Pumps, fans	34.7556	34.7556	34.7556	34.7556	34.7556	34.7556	34.7556	34.7556	34.7556	34.7556	34.7556	34.7556 (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)	-94.0448	-94.0448	-94.0448	-94.0448	-94.0448	-94.0448	-94.0448	-94.0448	-94.0448	-94.0448	-94.0448	-94.0448 (71)

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Total internal gains	108.7906	106.0902	100.7478	88.8479	81.6002	74.0059	69.2579	73.0541	77.5204	85.9466	97.3437	107.2547 (72)
	502.2304	515.3476	490.9124	471.7033	445.6128	428.5545	410.3936	412.0350	426.1820	441.9173	472.1574	491.5323 (73)

6. Solar gains

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

Northeast			3.7800	11.2829	0.5000		0.0000	0.7700	16.4201 (75)			
Southwest			1.9100	36.7938	0.5000		0.0000	0.7700	27.0563 (79)			

Solar gains	43.4764	79.5105	123.2767	177.0283	220.4504	228.6053	216.3428	182.4575	141.6559	91.7821	53.0680	36.5640 (83)
Total gains	545.7068	594.8581	614.1892	648.7316	666.0631	657.1598	626.7364	594.4925	567.8379	533.6994	525.2253	528.0964 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n _{l,m} (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	41.9906	42.2368	42.4859	43.7769	43.8499	43.8499	43.8499	43.8499	43.8499	43.8499	43.5125	42.9931
alpha	3.7994	3.8158	3.8324	3.9185	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	3.9008	3.8662
util living area	0.9677	0.9532	0.9308	0.8689	0.7606	0.5942	0.4485	0.4895	0.6984	0.8816	0.9484	0.9707 (86)
MIT	19.5397	19.7427	20.0247	20.4450	20.7516	20.9295	20.9818	20.9741	20.8654	20.4920	19.9926	19.5411 (87)
Th 2	20.1512	20.1558	20.1603	20.1831	20.1844	20.1844	20.1844	20.1844	20.1844	20.1844	20.1785	20.1694 (88)
util rest of house	0.9622	0.9454	0.9188	0.8462	0.7200	0.5311	0.3702	0.4096	0.6394	0.8565	0.9385	0.9657 (89)
MIT 2	18.4452	18.7034	19.0598	19.5908	19.9471	20.1309	20.1746	20.1697	20.0732	19.6560	19.0368	18.4595 (90)
Living area fraction									f _{LA} = Living area / (4) =			0.3771 (91)
MIT	18.8580	19.0954	19.4237	19.9129	20.2505	20.4321	20.4790	20.4731	20.3719	19.9713	19.3972	18.8674 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8580	19.0954	19.4237	19.9129	20.2505	20.4321	20.4790	20.4731	20.3719	19.9713	19.3972	18.8674 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9515	0.9333	0.9063	0.8378	0.7235	0.5509	0.3990	0.4386	0.6538	0.8491	0.9271	0.9558 (94)
Useful gains	519.2524	555.1768	556.6477	543.5143	481.9084	362.0591	250.0468	260.7224	371.2261	453.1520	486.9154	504.7398 (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	997.4514	966.9378	875.1545	723.7706	561.0036	382.6472	254.5038	267.2359	411.5065	614.8550	813.0867	981.5162 (97)
Space heating kWh	355.7800	276.7034	236.9690	129.7845	58.8468	0.0000	0.0000	0.0000	0.0000	120.3071	234.8433	354.7216 (98a)
Space heating requirement - total per year (kWh/year)												1767.9557
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	355.7800	276.7034	236.9690	129.7845	58.8468	0.0000	0.0000	0.0000	0.0000	120.3071	234.8433	354.7216 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1767.9557
Space heating per m2										(98c) / (4) =		23.7182 (99)

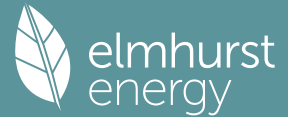
9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Fraction of main heating from main system 2												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
Efficiency of main space heating system 1 (in %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	355.7800	276.7034	236.9690	129.7845	58.8468	0.0000	0.0000	0.0000	0.0000	120.3071	234.8433	354.7216 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	355.7800	276.7034	236.9690	129.7845	58.8468	0.0000	0.0000	0.0000	0.0000	120.3071	234.8433	354.7216 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Space heating fuel used, main system 2												0.0000 (213)

Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	2840.2527 (238)

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	1767.9557	1.5748	2784.1922 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	792.3340	1.5223	1206.1386 (278)
Space and water heating			3990.3308 (279)
Pumps, fans and electric keep-hot	23.7598	1.5128	35.9438 (281)
Energy for lighting	256.2031	1.5338	392.9729 (282)
Total Primary energy kWh/year			4419.2475 (286)
Dwelling Primary energy Rate (DPER)			59.2900 (287)

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1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	4.9900 (1b)	x 2.5600 (2b)	= 12.7744 (1b) -
First floor	69.5500 (1c)	x 2.8600 (2c)	= 198.9130 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.5400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.6874 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1417 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3917 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3623 (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	0.4620	0.4529	0.4439	0.3986	0.3895	0.3442	0.3442	0.3352	0.3623	0.3895	0.4076	0.4257 (22b)
Effective ac	0.6067	0.6026	0.5985	0.5794	0.5759	0.5592	0.5592	0.5562	0.5656	0.5759	0.5831	0.5906 (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
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.20)			5.6900	1.1450	6.5153		(27)
Heat Loss Floor 1			4.9900	0.1300	0.6487		(28a)
External Wall 1	22.1738	7.5800	14.5938	0.1800	2.6269		(29a)
Corridor wall	25.0400		25.0400	0.1800	4.5072		(29a)
External Roof 1	69.5500		69.5500	0.1100	7.6505		(30)
Total net area of external elements Aum(A, m ²)			121.7538				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	23.8386		(33)
Party Wall 1			81.6700	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 147.0496 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	9.9200	0.0500	0.4960
E2 Other lintels (including other steel lintels)	9.0200	0.0500	0.4510
E3 Sill	31.8000	0.0500	1.5900
E4 Jamb	31.9800	0.1600	5.1168
E5 Ground floor (normal)	9.6800	0.0900	0.8712
E16 Corner (normal)			

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.5250 (36)

Point Thermal bridges

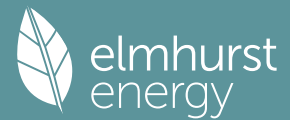
Total fabric heat loss (33) + (36) + (36a) = 32.3636 (37)

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	42.3831	42.0937	41.8099	40.4772	40.2278	39.0671	39.0671	38.8521	39.5142	40.2278	40.7323	41.2596 (38)
Heat transfer coeff	74.7467	74.4572	74.1735	72.8407	72.5914	71.4306	71.4306	71.2157	71.8777	72.5914	73.0958	73.6232 (39)
Average = Sum(39)m / 12 =												72.8395

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0028	0.9989	0.9951	0.9772	0.9739	0.9583	0.9583	0.9554	0.9643	0.9739	0.9806	0.9877 (40)
HLP (average)												0.9772
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3511 (42)
Hot water usage for mixer showers	63.6402	62.6839	61.2902	58.6237	56.6559	54.4614	53.2141	54.5972	56.1133	58.4695	61.1933	63.3964 (42a)
Hot water usage for baths	27.4906	27.0823	26.5074	25.4473	24.6536	23.7734	23.2980	23.8689	24.4905	25.4323	26.5142	27.3977 (42b)
Hot water usage for other uses	38.7078	37.3003	35.8927	34.4852	33.0776	31.6700	31.6700	33.0776	34.4852	35.8927	37.3003	38.7078 (42c)
Average daily hot water use (litres/day)												119.3512 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	129.8387	127.0665	123.6903	118.5562	114.3871	109.9049	108.1821	111.5437	115.0890	119.7946	125.0078	129.5019 (44)
Energy content (annual)	205.6327	180.9410	190.1074	162.2975	153.9870	135.1409	130.8369	138.1144	141.9162	162.5601	178.0965	202.7687 (45)
Distribution loss (46)m = 0.15 x (45)m	30.8449	27.1411	28.5161	24.3446	23.0980	20.2711	19.6255	20.7172	21.2874	24.3840	26.7145	30.4153 (46)
Water storage loss:												150.0000 (47)
Store volume												1.3938 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7527 (55)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	252.2276	223.0267	236.7023	207.3894	200.5819	180.2327	177.4318	184.7093	187.0081	209.1550	223.1883	249.3636 (62)
WWHRS	-29.0937	-25.7307	-26.9437	-22.3104	-20.7925	-17.7923	-16.6775	-17.7348	-18.4086	-21.7017	-24.5854	-28.5549 (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	223.1340	197.2960	209.7587	185.0789	179.7894	162.4404	160.7543	166.9745	168.5995	187.4533	198.6029	220.8087 (64)
Total per year (kWh/year)												2261.6905 (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	105.6488	93.8314	100.4866	90.0374	88.4766	81.0078	80.7792	83.1989	83.2606	91.3271	95.2906	104.6965 (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	117.5561	117.5561	117.5561	117.5561	117.5561	117.5561	117.5561	117.5561	117.5561	117.5561	117.5561	117.5561 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	127.5197	141.1825	127.5197	131.7703	127.5197	131.7703	127.5197	127.5197	131.7703	127.5197	131.7703	127.5197 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	207.6533	209.8081	204.3781	192.8183	178.2260	164.5114	155.3492	153.1944	158.6244	170.1842	184.7765	198.4911 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.7556	34.7556	34.7556	34.7556	34.7556	34.7556	34.7556	34.7556	34.7556	34.7556	34.7556	34.7556 (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)	-94.0448	-94.0448	-94.0448	-94.0448	-94.0448	-94.0448	-94.0448	-94.0448	-94.0448	-94.0448	-94.0448	-94.0448 (71)
Water heating gains (Table 5)	142.0011	139.6301	135.0627	125.0519	118.9202	112.5108	108.5742	111.8265	115.6397	122.7515	132.3480	140.7211 (72)
Total internal gains	538.4409	551.8876	528.2273	510.9074	485.9327	467.0594	449.7099	450.8075	464.3013	481.7223	510.1616	527.9987 (73)

6. Solar gains

[Jan]			Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
Northeast			3.7800		11.2829		0.6300		0.7000		0.7700		13.0342 (75)	
Southwest			1.9100		36.7938		0.6300		0.7000		0.7700		21.4773 (79)	
Solar gains			34.5116	63.1154	97.8571	140.5251	174.9935	181.4669	171.7329	144.8348	112.4465	72.8566	42.1253	29.0245 (83)
Total gains			572.9525	615.0030	626.0844	651.4324	660.9262	648.5263	621.4428	595.6422	576.7478	554.5789	552.2870	557.0233 (84)

7. Mean internal temperature (heating season)

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

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tau	40.7342	40.8925	41.0490	41.8000	41.9436	42.6252	42.6252	42.7539	42.3600	41.9436	41.6541	41.3558
alpha	3.7156	3.7262	3.7366	3.7867	3.7962	3.8417	3.8417	3.8503	3.8240	3.7962	3.7769	3.7571
util living area	0.9693	0.9577	0.9400	0.8914	0.7998	0.6384	0.4868	0.5238	0.7291	0.8934	0.9517	0.9719 (86)
MIT	19.4613	19.6445	19.9163	20.3275	20.6721	20.9030	20.9736	20.9649	20.8307	20.4191	19.9042	19.4491 (87)
Th 2	20.0810	20.0843	20.0874	20.1024	20.1052	20.1182	20.1182	20.1207	20.1132	20.1052	20.0995	20.0936 (88)
util rest of house	0.9636	0.9500	0.9286	0.8697	0.7588	0.5691	0.3969	0.4337	0.6665	0.8681	0.9417	0.9668 (89)
MIT 2	18.2932	18.5259	18.8696	19.3865	19.7930	20.0459	20.1047	20.1015	19.9754	19.5061	18.8662	18.2863 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.7337	18.9477	19.2643	19.7414	20.1245	20.3691	20.4324	20.4271	20.2979	19.8504	19.2577	18.7248 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7337	18.9477	19.2643	19.7414	20.1245	20.3691	20.4324	20.4271	20.2979	19.8504	19.2577	18.7248 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9530	0.9380	0.9159	0.8597	0.7597	0.5898	0.4297	0.4661	0.6805	0.8597	0.9300	0.9567 (94)
Useful gains	546.0043	576.8769	573.4418	560.0229	502.1211	382.4790	267.0569	277.6106	392.4667	476.7935	513.6257	532.9195 (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	1078.8697	1045.9546	946.7756	789.6939	611.5472	412.0907	273.7497	286.7920	445.4934	671.4977	888.6746	1069.3594 (97)
Space heating kWh	396.4519	315.2202	277.7603	165.3631	81.4130	0.0000	0.0000	0.0000	0.0000	144.8599	270.0353	399.1113 (98a)
Space heating requirement - total per year (kWh/year)												2050.2150
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	396.4519	315.2202	277.7603	165.3631	81.4130	0.0000	0.0000	0.0000	0.0000	144.8599	270.0353	399.1113 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2050.2150
Space heating per m2												(98c) / (4) = 27.5049 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	396.4519	315.2202	277.7603	165.3631	81.4130	0.0000	0.0000	0.0000	0.0000	144.8599	270.0353	399.1113 (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)	429.5254	341.5170	300.9321	179.1583	88.2048	0.0000	0.0000	0.0000	0.0000	156.9446	292.5626	432.4066 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	223.1340	197.2960	209.7587	185.0789	179.7894	162.4404	160.7543	166.9745	168.5995	187.4533	198.6029	220.8087 (64)
Efficiency of water heater	85.3340	85.1051	84.6904	83.8081	82.4031	79.8000	79.8000	79.8000	79.8000	83.4886	84.7494	79.8000 (216)
Fuel for water heating, kWh/month	261.4830	231.8264	247.6771	220.8366	218.1828	203.5594	201.4465	209.2412	211.2775	224.5257	234.3415	258.6475 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	26.4961	21.2561	19.1388	14.0219	10.8309	8.8490	9.8803	12.8428	16.6816	21.8871	24.7214	27.2325 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-35.0048	-49.3947	-71.0385	-79.8973	-86.1607	-80.4270	-79.4758	-75.0803	-67.2428	-56.5676	-38.5194	-30.2619 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-19.5658	-41.2103	-82.0067	-123.2999	-163.1512	-163.9647	-161.9924	-137.0523	-100.3449	-58.9201	-26.1200	-15.4639 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												2221.2514 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.8000

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Water heating fuel used	2723.0452 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	213.8385 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1842.1631 (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	3401.9719 (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	2221.2514	0.2100	466.4628 (261)
Total CO2 associated with community systems			0.0000 (261)
Water heating (other fuel)	2723.0452	0.2100	571.8395 (264)
Space and water heating			1038.3023 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	213.8385	0.1443	30.8635 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-749.0709	0.1346	-100.8043
PV Unit electricity exported	-1093.0922	0.1259	-137.5864
Total			-238.3908 (269)
Total CO2, kg/year			842.7043 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.3100 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2221.2514	1.1300	2510.0141 (275)
Total CO2 associated with community systems			0.0000 (275)
Water heating (other fuel)	2723.0452	1.1300	3077.0410 (278)
Space and water heating			5587.0551 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	213.8385	1.5338	327.9926 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-749.0709	1.4974	-1121.6262
PV Unit electricity exported	-1093.0922	0.4620	-505.0357
Total			-1626.6619 (283)
Total Primary energy kWh/year			4418.4866 (286)
Target Primary Energy Rate (TPER)			59.2800 (287)